SITE INSPECTION REPORT

PHELPS DODGE HISTORICAL SMELTER

U.S Highway 80 @ The Copper Queen Mine
Bisbee, Arizona
Cochise County

EPA ID#: AZD981680242

State ID#: 22

PREPARED BY:
James D. Williams
August 28,1991

ARIZONA DEPARTMENT OF ENVIRONMENTAL QUALITY
OFFICE OF WATER QUALITY
GROUNDWATER HYDROLOGY SECTION
SITE ASSESSMENT HYDROLOGY UNIT

ARIZONA DEPARTMENT OF ENVIRONMENTAL QUALITY

FIFE SYMINGTON, GOVERNOR
EDWARD Z. FOX, DIRECTOR

H-4942.26

September 18, 1991

Lisa Nelson (H-8-1)
U.S. Environmental Protection Agency
Region IX
75 Hawthorne Street
San Francisco, CA 94105

RE: PHELPS DODGE HISTORICAL SMELTER

Dear Lisa:

Enclosed is the Site Inspection Report for the above facility. The analytical results of the sampling conducted in October 1990 are summarized and recommendations for further action under CERCLA are included.

If you have any questions or need additional information call me at (602) 257-2134.

Sincerely,

Dan Williams

Dan Wiliams, Hydrologist
Site Assessment Hydrology Unit

DW:hy

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SITE INSPECTION REPORT

PHELPS DODGE HISTORICAL SMELTER

1.0 Site Description

Masonry adobe furnaces (hereafter referred to as smelters) were constructed across the southwest in the late 1800's to refine oxide ores of copper, lead, arsenic, antimony and other heavy metals. Before the advent of scrubbers and other devices used to filter the exhaust from smelters, particulates of these metals were emitted into the air to settle on soil and local surface water. Most of the smelters in Arizona are now abandoned and many of the sites may only be approximated from historical documents. One such site, owned and formerly operated by the Phelps Dodge Company, is located along U.S. Highway 80 in Bisbee, Arizona (Fig. 1). The approximate geographic location of the Phelps Dodge Historical Smelter (PDHS) is the SE 1/4, SE 1/4, SW 1/4 Section 9, Township 23 South, Range 24 East [(D-23-24)9cdd]. The site consists of two abandoned smelter facilities, each located near the mouth of Brewery Gulch in Bisbee. Bordering the site to the east, west and south is Phelps Dodge property. The PD property is fenced to prevent entry into the numerous abandoned, unstable mine shafts. Figure 2 gives the locations of the mines and the former smelter sites. To the north of the site is U.S. Highway 80 and the town of Old Bisbee.

The original smelter site was located approximately 1200 feet east of the entrance to the principal mine of the area, the Copper Queen. A single 36-inch diameter furnace was used to smelt the copper ore **(11)(15)(17)**. Within a year, another furnace was added at this location. Because the demand for copper continued to exceed the production capacity of the facility, the smelter was moved to a new site 300 feet to the east and expanded again **(11)(17)**. The facility now included four furnaces with a production capacity of 1,000,000 pounds of copper ore per month **(15)**. Even with the addition of a fifth furnace in 1901, the demand for the metal could not be met. In 1904, the facility was finally scrapped when a modern, high capacity smelter was completed at Douglas, Arizona **(11)(17)**. The locations of the PDHS facility have since been razed by construction of the parking lot for the Copper Queen Mine Museum and the Holbrook extension of the Lavender Pit mine (Fig. 2) The only remaining evidence of the Bisbee smelters are small masonry structures on Bucky O'Neil Hill that were erected as foundations for smelter stacks.

1.1 Site History/Ownership

The discovery of base metal deposits in the Mule Mountains surrounding Bisbee (The Warren Mining District) was made in 1877 by a scouting party from nearby Fort Bowie. To process the

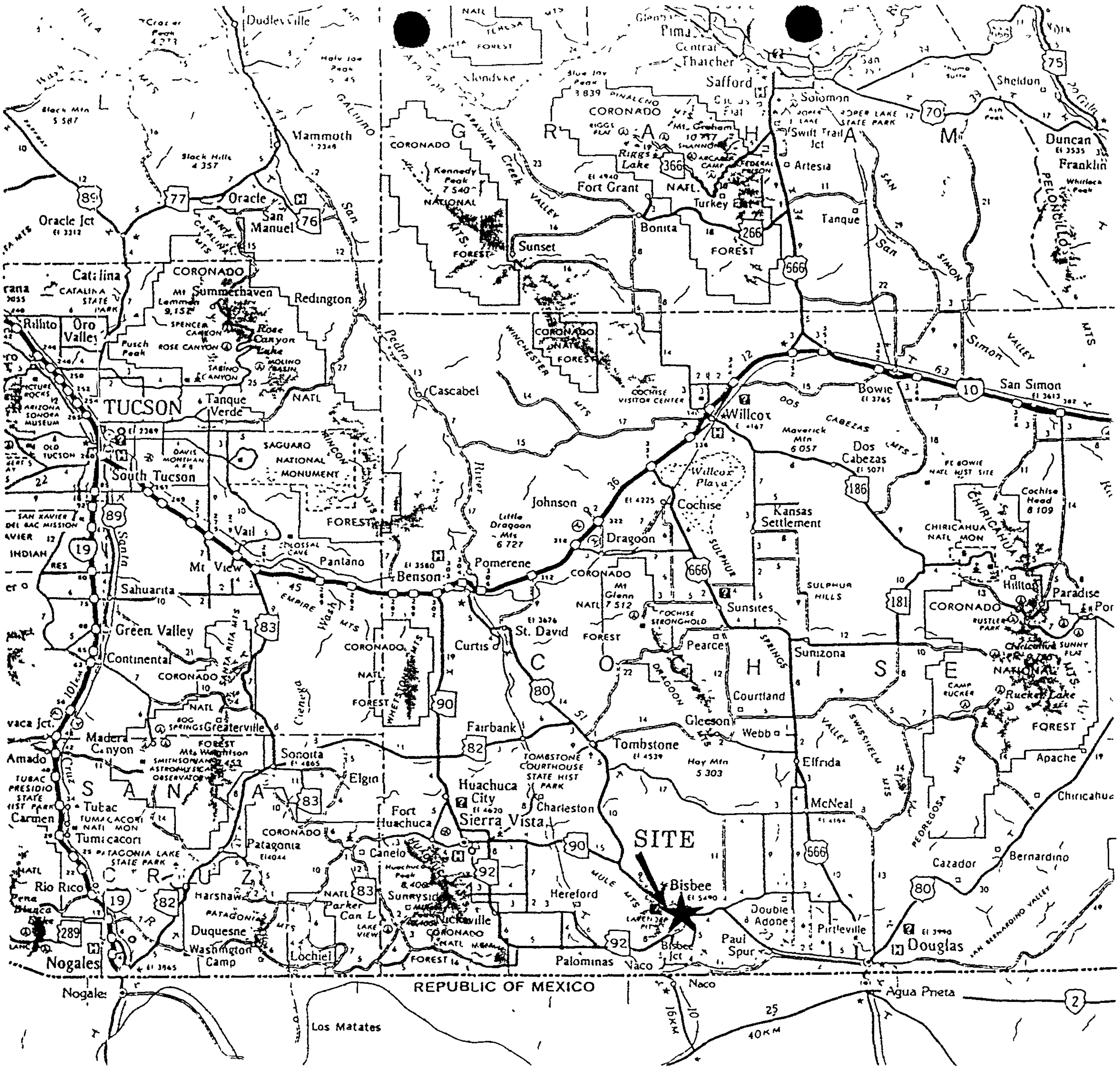

FIGURE 1 Site Location Map

Phelps Dodge Historical Smelter, Bisbee, Arizona

N

Scale in miles

0 10 20 30 40

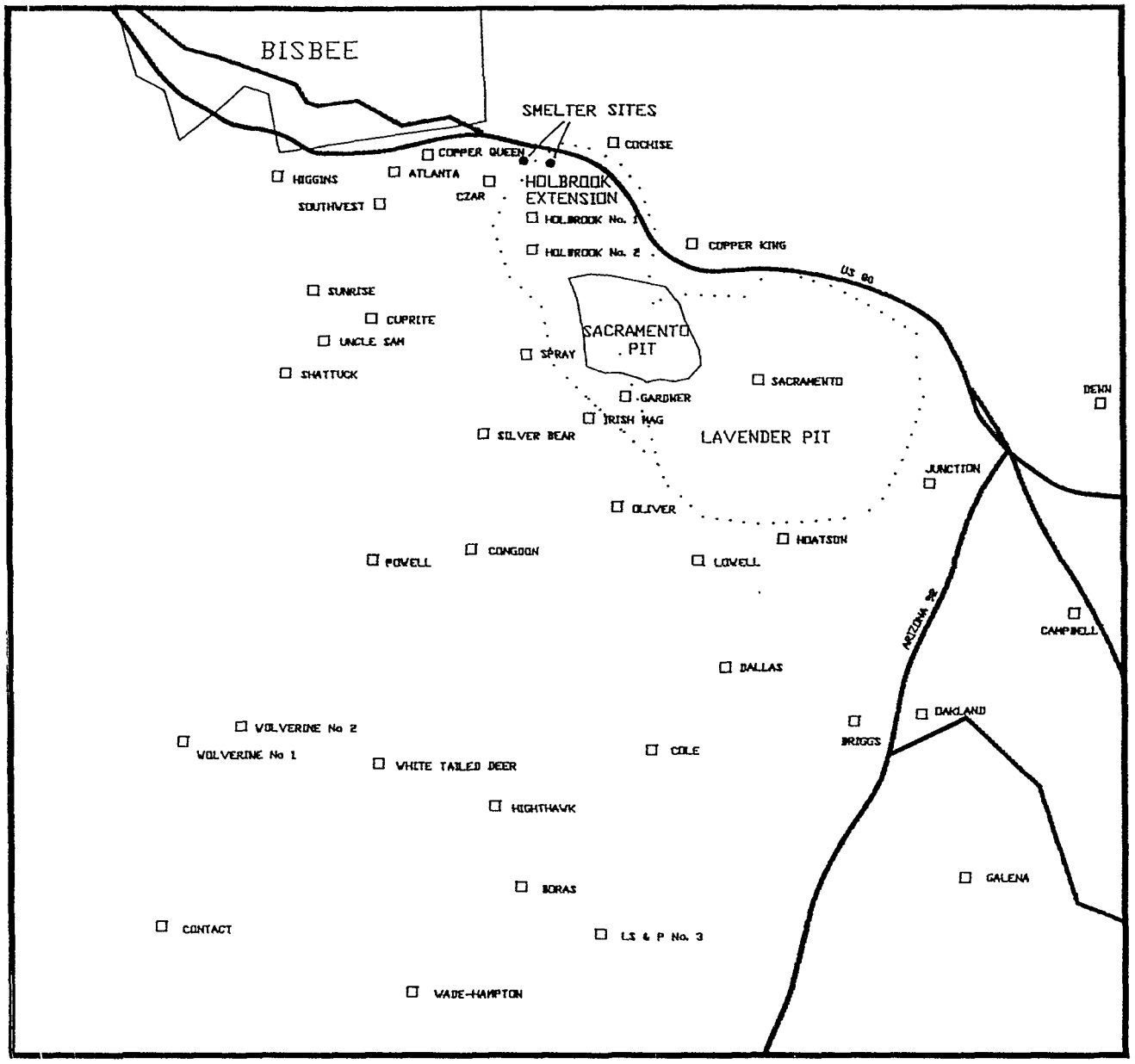

Figure 2: Location of Mines and the Historic Smelter

N

0 1km

Source: The Mineralogical Record
September - October, 1981

scattered outcrops of oxide lead ore (cerrusite), an adobe masonry furnace was constructed in April, 1878 near Castle Rock along Tombstone Canyon. These early furnaces were primitive, consisting only of a hearth, side walls, end walls and a roof. A combination of molten metal and slag was produced by heating the ore over a charcoal fire. This furnace had the capacity to produce 600 pounds of lead-silver concentrate or matte every four to six hours **(11)**. However, production was not adequate to meet expenses and the smelter was scrapped. In the summer of 1877, several important claims of the district were filed. Among the claims was the Copper Queen which revealed, from an initial cut of only four feet by ten feet, a deposit of ore that assayed 23% copper.

In the spring of 1880, the Copper Queen mine was optioned to Mr. Edward Riley. On April 9, 1880, Mr. Riley sold half interest in the mine to the mining firm of Bisbee, Williams & Company of San Francisco. With this sale came the formation of the Copper Queen Mining Company **(2)**. Because of the previous closure of the smelter, however, ore from the Copper Queen and other mines in the area had to be hauled to the west coast and shipped to Wales for processing. To eliminate these high transportation costs, a water-cooled (jacketed) furnace designed specifically to reduce the high-grade oxide and siliceous copper ores was erected within 1200 feet of the entrance to the Copper Queen. Furnaces of this type were being mass produced in various sizes by the Pacific Iron Works of San Francisco under the trade name of Rankin and Brayton **(17)**. The 36-inch diameter furnace had the capacity to smelt 30 tons of ore per day **(11)**. By September, 1880, a 180-pound pig of 94-96% copper was being produced every 15 minutes. With the addition of another Rankin and Brayton furnace in late 1880, production was averaging about 20,000 pounds of copper per day **(17)**.

In June 1881, D.W. James and W.E.Dodge, the principals of Phelps, Dodge & Company (PDC), retained Dr. James Douglas to examine a claim adjacent to the Copper Queen for possible purchase. The purchase was made which marked the entry of PDC into the mining business as the Atlanta Mining Company. In August of 1885, a merger of the Atlanta Company and the Copper Queen Company was favorable to PDC which operated the mines under the name of The Copper Queen Consolidated Mining Company (CQCMC) **(11)(17)**. The smelting facility, its production capacity taxed by the ever increasing amount of ore to be refined, was now under the ownership of PDC. Dr. Douglas, still under contract from CQCMC, advised that the smelter be updated to cut costs and handle an even greater volume of ore. A larger, more economical smelter was erected about 300 feet east of the original Copper Queen smelter site. In May, 1887, four 36-inch diameter water-jacketed furnaces were put into operation. With the new smelting facility, production was escalated to 5,000 to 6,000 tons of copper bullion annually **(17)**.

The smelter was refurbished by the CQCMC in 1894 because the direct smelting procedure was no longer effective. As the easily smelted oxide ores were mined out, ores higher in sulfide content, and thus more difficult to refine, became the target of exploration activity. Due to the increase in sulfide content of the ore, the purity of the smelted copper was diminished and the selling price was jeopardized **(11)**. A new process was developed which required the addition of fluxing agents to the crushed ore to promote melting. When the mixture was smelted, slag and a mixture of copper, iron and sulfur known as matte was produced. The matte was separated and introduced to a second furnace or converter where the iron and sulfur were removed.

The new smelting plant, located at the present site of the northeast extension of the Lavender Pit mine, (See Fig. 2) consisted of four oval shaped water-jacketed furnaces. These furnaces measured 42 inches by 120 inches. Two tilting wells, arranged in tandem for each furnace, conveyed molten matte to the converters **(11)**. The daily average capacity of a furnace was about 160 tons. A single converter could reduce 30 to 40 tons of 45% copper matte to "blister copper" (metallic copper which is 99.5% pure) **(11)**. In an unsuccessful attempt to meet the insatiable demand for copper, the facility was enlarged again in 1901 to include 5 furnaces. Finally, a shortage of water, cramped space and the lack of a railroad combined to force the relocation of the Copper Queen smelter. The new smelter was completed at Douglas, Arizona on March 9, 1904. After 24 years of operation, the Bisbee smelter was closed on July 24, 1904 **(2)(11)(17)**.

1.2 Other Regulatory Involvement

The PDHS site has no RCRA status nor has it been considered for further action under the State Water Quality Assurance Revolving Fund (WQARF) program or other State programs.

Since the smelter no longer exists, there are no outstanding permits for the facility.

2.0 Apparent Problem

In 1975, the Division of Disease Prevention (DDP) of the Arizona Department of Health Services (ADHS) conducted a survey of heavy metal absorption in children that reside in "smelter towns" in Arizona as part of a nationwide study by the Center for Disease Control (CDC) **(14)**. The survey indicated that children that live in areas exposed to copper smelter emissions may have higher concentrations of blood lead than children who live in towns with no smelters. Elevated levels of blood lead are those that exceed 25 ug lead/100 ml whole blood **(23)**. It was determined by the CDC that inhalation or ingestion of metal particulates emitted by the smelters could have, in part, accounted for the increased lead absorption **(14)**.

The DDP study was expanded to Bisbee in October and November of 1985. Results of the study indicated that of 115 blood samples drawn, four children from the Bisbee area had elevated blood lead concentrations (43.8, 33.0, 29.6 and 26.0 ug/100 ml) **(23)**. It was later learned, however, that two of the children had recently lived in Morenci, Arizona (also a smelter town) and one of the children had been chewing on a crib which was painted with lead-based paint. No information was available on the fourth child **(23)**. Based on the findings of this study, it was determined that there was insufficient evidence to conclude that the blood lead levels in the children of Bisbee are related to the distance of residency from a smelter site **(23)**.

A follow-up study was conducted by the DDP in 1986. It was observed that the houses of each of the four Bisbee children showed evidence of old, peeling paint. Upon questioning the parents of the children, it was learned that each child had been observed chewing on paint chips. Samples of paint chips and surface soil from each dwelling were collected and analyzed for lead **(23)**. The lead content of the paint chips ranged from 968 to 34,157 ug/g and the soil lead level ranged from a low of 335 ug/g to a high of 729 ug/g **(23)**. Appendix B contains ADHS internal memos, analytical analyses of paint chips and soil samples, and other support documentation of the DDP blood lead studies in Bisbee.

Also as part of the study, soil samples were collected from Old Bisbee and the surrounding communities in 1986. From a total of 75 soil samples, lead was detected from a maximum concentration of 1648 ug/g to less than 50 ug/g with a median concentration of 216 ug/g. The Health Based Guidance Level (HBGL) for lead in soil is 400 ug/g **(18)**. Only 4 samples were reported as having lead concentrations of less than 50 ug/g. Appendix C gives the analytical results of the 1986 soil sampling by the DDP.

Although lead soil concentrations above the HBGL were reported, sampling locations were not precisely documented. The DDP concluded that the high concentrations of lead in the soils from Old Bisbee could be attributed to smelting activities conducted from 1878 to 1904 or to peeled lead-based paint from abandoned structures **(23)**. — bad ref.

Smelter emissions from the PDHS site may have contributed to the soil lead content of Bisbee, however, other smelters may be responsible for localized "hot spots" of soil lead contamination within the town. According to historical records, a primitive adobe smelter was constructed to smelt lead ore near the Castle Rock Spring in 1878 **(2)(6)**. The smelter was used for about two years and then scrapped, but contamination detected in the soil in the immediate area may be attributable to this smelting activity and not releases from the PDHS site. Refer to Section 4.4.1 for a discussion of the soil analyses.

In the absence of analytical data, there is no documented release to the groundwater beneath Bisbee or to surface water. Also, there is no documented release to the air. However, since the soil contains concentrations of lead above the HBGL, a systematic sampling effort as part of a Site Investigation (SI) under CERCLA was warranted. The SI was conducted to: a) confirm soil contamination by lead, and b) determine if groundwater quality has been adversely affected by heavy metals.

3.0 HRS Factors

3.1 Waste Type/Quantity

Hazardous wastes generated by the PDHS consist of metal particulates which were released to the air during the smelting process. The fallout of these metal particulates has resulted in elevated concentrations of heavy metals, notably lead, in the topsoil surrounding the site. The waste quantity is difficult to ascertain since the smelter emissions are undocumented and originated from several smelters of different capacities over a span of 25 years. Also, the total quantity and metal content of the ore processed varied from day to day. To estimate a general total waste quantity generated by the PDHS, determinations should be made for: the amount of ore processed in tons from 1880 to 1904, weight percent of metals in the ore, and the efficiency of the smelting process.

The smelters ran almost continuously from about 1878 to 1904 except when the mines closed for nearly a year in 1886-87 due to low copper prices. From 1880 to 1886, the total capacity of two 36-inch smelters exceeded 500,000 pounds of copper per month. During the shutdown of 1886, an enlarged smelter was built that had the capacity to produce 1,000,000 pounds of copper ingots per month. In 1894, the smelter was expanded again and modified to process ore containing increasing amounts of sulfides. By 1899, the smelter was producing more than 3,000,000 pounds of copper per month. Copper, however, has not been detected in the soil in concentrations that exceed the HBGL of 26,000 mg/kg.

Another method of estimating waste quantity may be to correct the total metal production to metal recovery efficiency in the smelting process. Metal production through 1975 has been reported as: 7.7 billion pounds of copper, 335 million pounds of zinc, 324 million pounds of lead, 100 million ounces of silver and 2.7 million ounces of gold **(2)**. Of the total lead production, about 105 million pounds has been produced since the end of World War II. This calculates to about 219 million pounds of lead produced for the years 1878 to 1945. Assuming that lead production remained consistent for 66 years (except for the hiatus in 1886-87), 3.3 million pounds of lead were produced each year until 1945. Therefore, a total of approximately 82.5 million pounds of lead was produced by smelting in Bisbee (1878 to 1904). If the smelting process was efficient to 99.0 percent

(which was unlikely in the early days of primitive adobe and water-jacketed furnaces) the quantity of lead particulates emitted into the air would be roughly 825,000 pounds or 412.5 tons. This quantity represents a minimum case because the assumed efficiency of the smelting process is probably overestimated.

3.2 Groundwater

3.2.1 Geology

The local geology has been thoroughly studied because of the voluminous mineral deposits. The producing area, also known as the Warren Mining District, comprises a zone of about 3 by 2 miles in the foothills of the Mule Mountains. Over 30 separate mine shafts were sunk resulting in a total of approximately 2000 miles of underground workings **(2)**. Hundreds of millions of tons of ore has been removed from these underground working and 2 open pit mines. Copper is still being produced by leaching of the pits and mine dumps. Underground activity ceased in 1975.

Mining activity began in Bisbee in 1877 following the discovery of a small outcrop of cerussite ($PbCO_3$) in Tombstone Canyon. Since that time to mid-1975, cerussite and many other lead minerals of both hypogene (primary) and supergene (secondary) origin have been mined at Bisbee. Although the District has become best known for production of copper, 324 million pounds of lead has also been produced from the mines.

During the early years, the ore (copper) was not processed locally but was carried overland to the west coast and shipped to Wales for smelting. In 1880, in an effort to reduce overhead costs from shipping, a smelter was erected in Bisbee. The ores mined from the 1880's until 1904 were processed exclusively at smelters located at or near the entrance to the Copper Queen Mine **(14)**. Present contamination of soils by lead is probably attributable in part to 24 years of releases to the air of metal particulates during smelting activities. However, the town of Bisbee is situated on thin, residual soils or exposures of the PreCambrian Pinal Schist (1.7 Ga) and Granite of Jurassic age (177 Ma) which may be locally mineralized **(2)(3)**. Previous sampling results indicate that background concentrations of lead and other heavy metals may be high in areas where soils are derived from eroded bedrock containing these mineralized pockets.

The Mule Mountains are divided into 2 geologic tracts by the Dividend fault which runs parallel to U.S. Highway and up Tombstone Canyon. The fault is downthrown to the south and displacement ranges from approximately 2000 feet at the "Old Glory Hole" to about 5000 feet 2 1/2 miles to the east **(3)**. To the southwest of the canyon exposures are mainly Paleozoic rocks with scattered windows to the Pinal Schist. The Paleozoic

sediments and their periods of deposition, in ascending order, are the: Bolsa Quartzite (Cambrian), Abrigo Limestone (Cambrian), Martin Limestone (Devonian), Escabrosa Limestone (Mississippian), and Naco Limestone (Pennsylvanian-Permian). The Paleozoic beds south of Bisbee demonstrate a gentle to moderate dip to the southeast away from a dome structure formed by the intrusion of the Juniper Flat Granite (177 Ma). The Abrigo, Martin and Escabrosa Limestones are the main ore-producing formations in the district **(3)**.

Approximately 2 miles east of the Granite is the Sacramento Quartz Porphyry stock (180 Ma) from which the mineralizing fluids originated. Geologic mapping suggests that the stock is an intrusive complex rather than a single intrusive body **(3)**. Prior to the surge of copper-bearing hydrothermal solutions, the limestone formations in contact with the porphyry were fractured or brecciated. Replacement of limestone occurred as the fluids migrated into the fractures and precipitated as oxide ore minerals. Malachite, azurite, native copper and cuprite occur in the Bisbee district as oxide ore minerals. At depth, there is an abrupt transition from oxide ore to hypogene sulfide minerals such as chalcopyrite, galena, chalcocite, bornite and sphalerite.

Northeast of the fault, the rocks are predominantly Cretaceous in age. These rocks comprise a predominantly clastic sedimentary package that consists of the Glance Conglomerate, the Morita sands and shales, the Mural Limestone and the Cintura sands and shales.

North of the Dividend Fault, the Paleozoic section has been removed by erosion and the Pinal Schist is exposed in outcrop. Fractures in the schist have been determined by the USGS and the ADWR to be the source of groundwater in Bisbee. The rock is a fine-grained, fissile, quartz-sericite schist, and probably represents metamorphosed sediments. Neither the top nor the base of the unit has been found, therefore, the thickness beneath Bisbee is unknown.

A detailed soil survey of the Bisbee area is not available. Generally, the soil found in the Mule Mountains, including Bisbee, is the Lithic Haplustolls-Lithic Argiustolls-Rock Outcrop Association **(24)**. These soils are described as shallow, gravelly and cobbly, moderately coarse to moderately fine-textured, gently sloping to very steep soils and rock outcrop on hills and mountains **(24)**. Qualitatively, the soils have a very low water capacity and a low to moderately permeability **(24)**.

3.2.2 Hydrology

Extensive Laramide and Basin & Range faulting of the Bisbee area has complicated the local hydrogeology. As mentioned, the basin

fill aquifer is a separate groundwater system from the fractured, crystalline aquifer that supplies the wells at Bisbee. According to the USGS, the groundwater flow of the Bisbee area is diverted along a divide that is generally contiguous with the Dividend Fault zone **(3)**. The fault zone runs south of Bisbee along U.S. Highway 80 from Lincoln School to Saginaw, Arizona where it is lost beneath the alluvium. Although the aquifers are considered to be separate, the permeability to groundwater flow across the fault has not been determined. It appears likely that the aquifers could be interconnected by a series of fractures which exist in the crystalline rocks adjacent to the fault zone or leakage across the fault. A potential recharge area to the basin fill aquifer is coincident with the fault zone and the foothills of the Mule Mountains to the south.

The town of Old Bisbee is located to the north of the basin-fill aquifer in the Pinal Schist. This metamorphic unit is exposed due to uplift along the Dividend Fault and subsequent removal of the overlying Paleozoic sediments by erosion. Near the fault, the rock is fractured and according to the USGS and the Arizona Department of Water Resources (ADWR), wells in Bisbee yield between 5 and 35 gallons/minute from these fractures **(4)(5)**. An exception, the Castle Rock well, is a spring located south of the dividend fault which produces water from a faulted sliver of Martin Limestone.

The direction of groundwater flow in the vicinity of Bisbee has not been documented. The geometry of the fracture system in the schist will likely influence the groundwater flow direction but the overall effects are not known. In the basin-fill aquifer to the south, the groundwater moves generally in the same direction as surface runoff which is to the south and southwest **(4)**. The subsurface flow ultimately moves into a cone of depression at the Naco well field.

Since the Bisbee area obtains drinking water only from groundwater, the basin-fill aquifer to the south (including the well field at Naco, Arizona which supplies Bisbee) has been designated a Sole Source Aquifer under Section 1424(e) of the Safe Drinking Water Act (SDWA) of 1974. This program authorizes the U.S. Environmental Protection Agency (EPA) to review Federal financially-assisted projects planned for the area to determine their potential to contaminate the aquifer. If potential contamination exists, the EPA may terminate the commitment of federal funds to the project. It is not known if the bedrock aquifer that underlies Bisbee is hydraulically connected to the basin-fill aquifer.

Approximately 6500 acre-ft of groundwater was pumped from the basin-fill aquifer for irrigation, public supply, mining, domestic and stock purposes in 1985 **(13)**. Of this total, 3600 to 4200 acre-ft was used for agriculture based on an estimated consumptive use by alfalfa of about 3.0 to 3.5 ft/acre/year **(13)**.

According to the ADWR, there is one well to the south of the Smelter site within a three mile radius, however, it is located in the basin fill aquifer. Most of the local wells are to the north of PDHS in Bisbee. The nearest public drinking water wells are in the Bisbee Well Field which is located approximately 9 miles to the south near Naco, Arizona. Although these wells supply most of the drinking water to Bisbee, some of the domestic wells in upper Tombstone Canyon may be used for drinking water. The nearest domestic well is located at the Castle Rock Inn approximately 2000 feet from the PDHS site.

It is not known how many residents of Bisbee obtain drinking water from their wells. It was confirmed by ADEQ that 2 of the wells sampled were used for drinking water purposes. Assuming 3 people served per domestic well, a speculative target population for groundwater is less than 50 people.

Within the city of Bisbee, depth to groundwater averages about 40 feet **(4)(13)**. Depth to groundwater beneath PDHS is not known.

The average annual rainfall for Bisbee is 17.34 inches **(12)**. The mean annual lake evaporation of the area is approximately 66 inches **(25)**. The calculated net annual rainfall is -48.66 inches.

3.3 Surface Water

There is no perennial surface water within three miles of the smelter site and there is no documented usage of surface water for drinking purposes, therefore, the population served is zero. Bisbee is located in the Mule Mountains and the area is heavily dissected by erosion; slopes range from 2% to >50%. Streams in the area are ephemeral and flow only during periods of high rainfall. As the population of Bisbee grew in the late 1800's, the canyons became lined with homes and businesses. With the increased population came an increased need for wood to fuel the fires of industry and home. The removal of trees from the canyons and hills surrounding Bisbee invited flooding during the often heavy rainstorms of July and August. Several times in its early history, Bisbee was destroyed by flooding. After a severe flood in 1908, a concrete-lined drainage ditch was built along Tombstone Canyon to channel the floodwaters.

The 2 year 24-hour rainfall average for Bisbee is estimated to be 2.14 inches **(25)**.

3.4 Air

A release of hazardous compounds to the air has not been documented. However, contaminated soil surrounding the PDHS site indicates that airborne metal particulates may have been emitted from the smelter. The target population for the air route is the

number of people presently living within a four-mile radius of the smelter site. The present population is used since the concern is not with the original smelter emissions but with the potential of a release of metal particulates to the air from contaminated soil. An exact population figure is unavailable but an estimate is possible by assimilating several data sources. This estimate would include individuals residing in the towns of Bisbee, Warren, Saginaw, Galena, South Bisbee, Don Luis, Lowell, Huachuca Terrace, Briggs, and Tintown. According to the 1987 edition of "Arizona Statistical Review" published by the Valley National Bank of Arizona, the population of Bisbee is about 8060 people but it is not known if this figure includes the aforementioned surrounding communities. The EPA, Region IX, has reported that the current population of Bisbee is about 5300 **(4)**. They also estimate the current population of the Bisbee-Naco area (approximately 72 square miles) at 14,574 based on information obtained from the towns of Bisbee and Naco, Arizona. Excluding the town of Naco from the estimate, the target population for the air route is approximately 11,000 people.

3.5 On-Site Pathway

The risk of direct exposure to the general public is low at the PDHS site because the area likely to be most contaminated by metal particulates is fenced and access is restricted. Contamination of the soil by lead has also been documented, however, outside of the fenced area (i.e. the residential and commercial areas of Bisbee). There is a potential for inhalation of metal particulates in these areas resulting from agitation of the contaminated soil. Since the Bisbee area is projected to triple its current population by the year 2000 **(4)**, there should be some concern about the dispersal of dust containing lead as a result of future development. Lead contaminated dust kicked up during the construction of new roads, houses and other projects would pose a health hazard to area residents. Also, a projected increase in mining activity and consequent renewed traffic on private, unpaved roads would cause the release of lead particulates to the air.

There is also a potential exposure of children to lead by ingestion of soil, especially in areas such as schoolyards and playgrounds. Additional work may be necessary to determine the degree of contamination in areas frequented by children.

3.6 Proposed Revised HRS Considerations

A Preliminary Assessment (PA) was prepared for the PDHS facility by the ADHS in October, 1986. Groundwater, air and additional soil sampling in Bisbee was recommended. The PA was the subject of two separate evaluations by ICF Technology Inc. dated December 23, 1987 and January 19, 1988. Their review comments were forwarded to the EPA, Region IX.

ICF Technology, Inc. recommended no further action under CERCLA in the memo of December, 1987 and the EPA concurred **(23)**. The recommendation was based on a low target population for groundwater, the lack of uses for surface water and the inability to evaluate a site based on soil conditions under the current Hazard Ranking System (HRS). With the proposed addition of the on-site exposure pathway in the revised HRS, however, PDHS may qualify for additional investigation under CERCLA. Also, the new HRS expands the exposure pathway for the air route to include the potential of a release of contaminants to the air from soil. Concentrations of lead above the HBGL have been documented in the soil at Bisbee. Because of potential adverse environmental impact and the revised eligibility of the site for further action under CERCLA, an SI was conducted by ADEQ.

The current HRS model allows a maximum assigned value for groundwater use if wells are used for drinking water and "no municipal water from alternate unthreatened sources are presently available". The Bisbee Well Field, which currently supplies more than 95% of the drinking water for the Bisbee-Naco area, is located in an alluvial basin fill aquifer approximately miles south of Bisbee. Since the aquifer is the primary source of drinking water for the area, it has been designated a Sole-Source Aquifer pursuant to Section 1424(e) of the SDWA of 1974 **(4)**. Without an alternate source of drinking water, contamination of the basin fill would represent a hazard to public health.

The crystalline bedrock aquifer from which Bisbee residents draw water may be hydraulically interconnected by fractures and faults with the basin fill **(20)**. If the aquifers are interconnected, any contamination present in the fractures could move downgradient a considerable distance and recharge the basin fill. In the current HRS multiple or interconnected aquifers are considered one aquifer if they function as a single hydrologic unit within a three-mile radius from the extent of known contamination. In the revised HRS, additional consideration may be given to interconnected aquifers in the evaluation of a site, especially if contamination attributable to the site extends beyond the proposed two-mile radius **(26)**.

Also, if the fractured basement acts as a recharge zone to the basin fill aquifer, it is included in the Sole Source Aquifer designation subject to the provisions of Section 1424(e) of the SDWA. A regional geohydrologic study prepared by the USGS to evaluate the Sole Source Aquifer petition indicates that there is a potential for groundwater contamination of the basin fill aquifer from upgradient copper leaching operations and sewage treatment facilities **(20)**. If contamination of the basin fill aquifer were to occur, an alternative source of drinking water may be the wells in Old Bisbee. In this round of sampling, no contaminants were detected in any of these wells that exceeded Federal MCLs concentrations or that confirmed a release.

The revised HRS model will also take into account the potential for direct human contact to a contaminant on-site **(26)**(See Section 3.6). The EPA considers soil ingestion as the most significant contact threat. Two population groups, the resident population and the nearby population (those people who have access to the site but do not reside, attend school or day care on the site) are evaluated for the likelihood of exposure **(26)**. The resident population group consists of those people who live or attend school or day care on-site. Since the soil in Old Bisbee contains lead in concentrations above background and the HBGL, the PDHS site boundaries are expanded to include the town of Bisbee. Under the resident population group, children under seven are considered a high risk subgroup because they are most likely to ingest soil than other people. In addition to those living on-site, i.e. within the town of Bisbee, children counted in the high risk group includes attendees of school or day care on-site. Therefore, the on-site exposure pathway must be considered in evaluating the PDHS site.

There are no Federal or State endangered species habitats, wetlands or wildlife sanctuaries within a three mile radius of the PDHS site. Also, the facility does not pose an actual or potential threat to sensitive environments or the food chain.

4.0 Summary of Investigative Efforts

To locate sampling points for soil and groundwater grab samples, a reconnaissance visit to Bisbee was conducted by the author on September 16, 1988. Mr. Arnold Nanez of the Cochise County Health Department provided assistance in locating wells. During that survey, 6 wells and 8 soil locations were selected for sampling. Soil sampling points were chosen to correlate with the described locations of previously reported soil lead detections by DDP personnel. The sites were also selected based on the assumption that the soil had been undisturbed since the time of smelter operations. The number of soil samples was later upgraded to 22 at the request of the EPA, Region IX. All sampling locations were located within 1 1/2 miles of the smelter site. The wells were all within the confines of Old Bisbee.

For the groundwater samples, all wells in the town of Old Bisbee that could be located were proposed for sampling. One well [M. Peeler; (D-23-24)8bba], however, was eliminated by the EPA when it was determined that the well may have been contaminated by a gasoline spill which occurred in the late 1970's. Another proposed well [R. McGinnis; (D-23-24)8bbb] was not sampled because the submersible pump was inoperable when the ADEQ sampling team arrived at the wellsite. A well owned by Ms. Lilian Saner [(D-23-24)7aba] was substituted for the McGinnis well.

The groundwater samples were collected on October 5-6, and October 10, 1989. See Table 1 for locations, ownership and construction parameters of wells that were sampled by ADEQ. In

accordance with the Federal Preliminary Assessment/Site Investigation (PA/SI) Program, the samples were analyzed by the EPA, Region IX laboratory in Las Vegas, Nevada. The samples were tested for Volatile Organic Compounds (VOCs) and dissolved metals.

Table 1: Well Locations, Ownership and Construction Parameters

Well No.	Owner	Casing Diameter	Screened Interval	Total Depth	Use[1]	Pump[2]
(D-23-24)9ccb	Castle Rock Inn	UC	---	65	U	N
(D-23-24)8bda	M. Edwards	24	35-48	50	H,I	Y
(D-23-24)8bab1	City of Bisbee	6	unknown	250	U	Y
(D-23-24)8bab2	G. Wright	14	unknown	100	H	Y
(D-23-24)7aba	L. Saner	UC	---	40	H	Y
(D-23-24)7abb	B. Kimberlin	6	unknown	150	H	Y

[1] Use of well is designated by the symbols:

H = Domestic, private well
I = Irrigation
U = Unused

[2] Pumps are either of the dedicated, submersible type or vertical turbine.

The soil samples were collected on October 10-11, 1989 and analyzed by the EPA, Region IX lab. Although the analyte of interest was lead, the soils were also tested for other heavy metals and for VOCs. The sample locations were selected randomly in the field in order to collect soil that presumably had been undisturbed since the closure of the smelter. Also, steep slopes and rocky terrain discouraged a systematic sampling grid. The random sampling method of undisturbed soil was used to establish a concentration gradient of contaminants in the soil relative to the historical smelter site. For this reason, areas such as lawns, schoolyards, traffic medians and other areas which may have been graded or covered by borrow soil were omitted.

4.1 Objectives of Sampling

4.1.1 Soils

To assess soil conditions and potential risk to human health and the environment, soil samples were collected from 22 locations (Figure 3). The primary objectives of soil sampling were to:

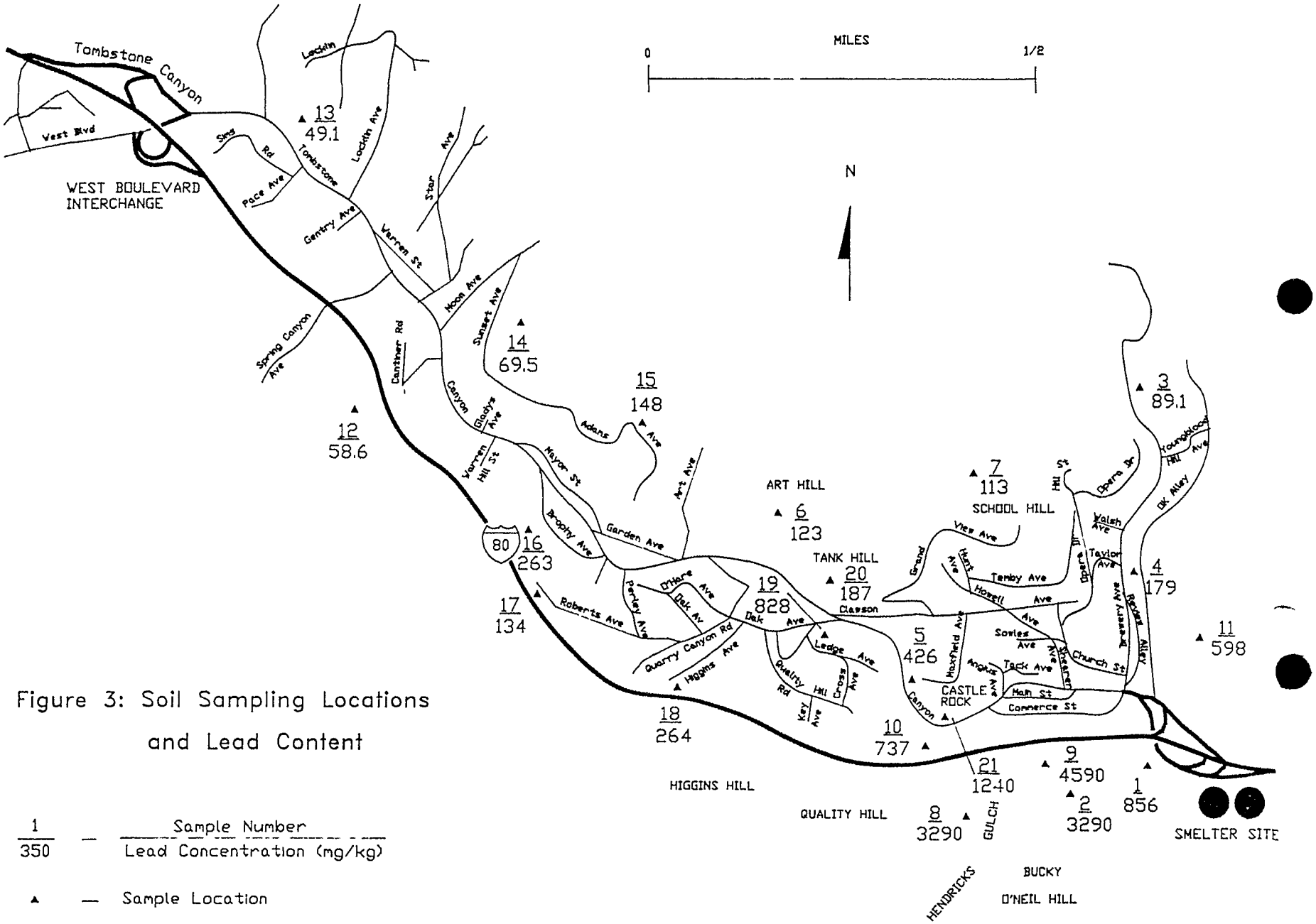

Figure 3: Soil Sampling Locations and Lead Content

1/350 — Sample Number / Lead Concentration (mg/kg)

▲ — Sample Location

1) Provide confirmatory data as well as Quality Assurance/ Quality Control (QA/QC) for the previous soil sampling results.

2) Collect sufficient representative data to establish a concentration gradient for soil contaminants, i.e. lead, arsenic and other heavy metals.

3) Correlate, if possible, the concentration gradient to historical emissions of metal particulates from the PD smelter.

4) Assess the need for further action under CERCLA or a State lead program based on the extent and severity of soil contamination.

4.1.2 Groundwater

Drinking water in Bisbee is provided by the Arizona Water Company from a well field located nine miles to the south near Naco, Arizona. Although the groundwater beneath Bisbee is not currently used for drinking purposes, there is concern that high lead and arsenic concentrations could render the water undesirable for future use. Assessment of the groundwater quality in addition to soil conditions is necessary to justify future actions under CERCLA. The main objectives of the groundwater sampling program were:

1) Collect data which will assist EPA in scoring the site under the HRS protocols for possible additional investigation under CERCLA.

2) Characterize the local groundwater quality by sampling domestic wells and a municipal well owned by the City of Bisbee.

3) Establish a vertical migration pathway for heavy metals by correlating the type and severity of groundwater contamination to soil contamination.

4.2 Previous Sampling

4.2.1 Soil Sampling

Lead has been detected in soils from Bisbee and surrounding communities in samples collected by the ADHS in 1986. A total of 75 soil samples were collected which contained lead at concentrations of 1648 ug/g to less than 50 ug/g with a median value of 216 ug/g. Only 4 samples were reported as having lead concentrations of less than 50 ug/g. (See Appendix C) High concentrations of lead in the soils from Old Bisbee has been attributed to smelting activities conducted from 1878 to 1904 or to peeled lead-based paint from abandoned structures **(23)**.

4.2.2 Groundwater Sampling

No previous analyses of the domestic wells of Bisbee were available. The City of Bisbee, however, did provide some analytical results of sampling from their fire training well [(D-23-24)8bab1]. The well has been tested for total metals but not for VOCs by the City. Total metal concentrations above Federal or State MCLs from this well have not been documented. Because of the lack of analytical data, aquifer conditions beneath the town of Bisbee were not determined.

4.3 Current Sampling Activities

4.3.1 Soil Sampling

Approximately 9 ounces of soil was collected at each of 22 locations using a clean metal trowel. Following the collection of each sample, the trowels were decontaminated with detergent and deionized water. The samples were contained in 9-oz wide mouth glass jars, labeled, and kept on ice at 4° C. Chain-of-custody and handling procedures were followed as specified in the approved sampling plan. Locations of soil samples collected by ADEQ are given in Figures 3 and 4.

4.3.2 Groundwater Sampling

At each well, the ADEQ sampling team collected samples in the appropriate bottles for each chemical parameter. For the VOA parameter, 80 ml of sample is required by the CLP laboratory. These samples were collected in 2 x 40 ml glass vials. All VOA samples were submitted for analysis with zero head space (e.g. no air bubbles). Samples for dissolved metals were collected and preserved in 3 x 1 liter polyethylene bottles. The required bottle types, collection methods, chain-of-custody, preservation, handling and shipping procedures were employed as specified in an EPA approved sampling plan. As indicated in the plan, field and equipment blanks were collected for each analytical parameter. A laboratory QA/QC sample and a duplicate sample were also collected. Table 2 lists the tested chemical parameters and EPA approved method numbers.

Table 2: Analytical Parameters for Groundwater Samples.

RAS Parameters	Method	Laboratory
Dissolved Metals and Major Cations		CLP
Semi-Volatile Organics	625	ADHS
RAS + SAS Parameters	**Method**	**Laboratory**
Volatile Organics	524	CLP

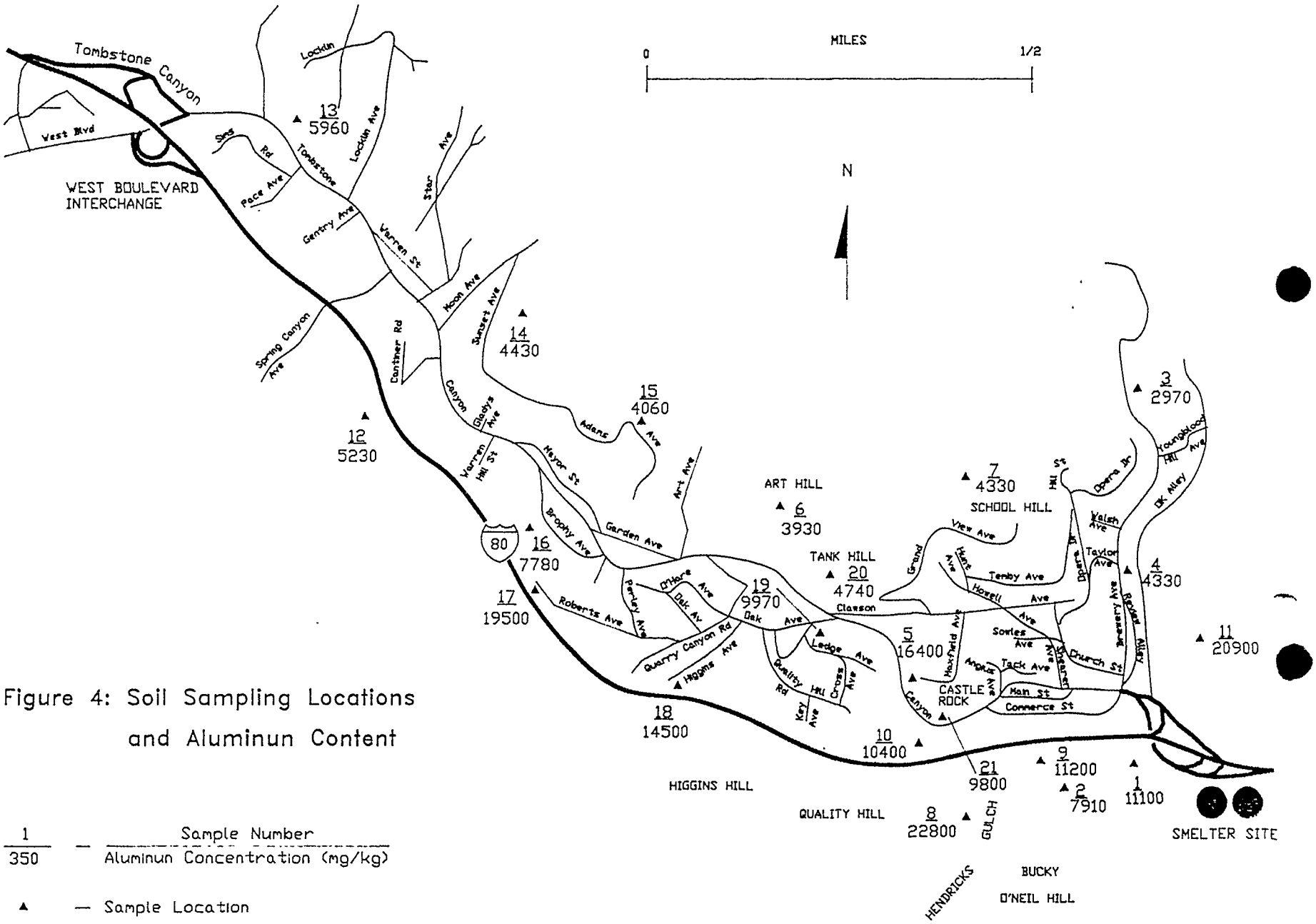

Figure 4: Soil Sampling Locations and Aluminun Content

1/350 — Sample Number / Aluminun Concentration (mg/kg)

▲ — Sample Location

Where possible, the wells were purged by a dedicated submersible pump of approximately three borehole volumes of water. During the purging process, measurements of pH, conductivity and temperature were recorded. When these parameters had stabilized to within less than a 5% fluctuation, groundwater samples were collected. The samples that were collected for metals analyses were filtered in the field with a peristaltic geopump through a 0.45-um filter. Most samples were collected from a tap located on a discharge pipe near the wellhead or by a bailer. Table 3 gives measurements of pH, temperature and specific conductance taken in the field.

TABLE 3: Field Observations

WELL	TEMPERATURE (C^{o})	pH	CONDUCTIVITY (umhos)
City of Bisbee	---	7.32	---
Saner	16.6	6.61	402
Kimberlin	16.8	7.53	419
Edwards	18.2	7.33	525
Wright	17.5	7.21	550
Castle Rock	19.0	7.62	800

A total of 10 samples, including a laboratory QC sample, a replicate and two blanks were collected from 6 wells near the historical smelter site. For well locations relative to the site, see Figure 5. A summary of known construction data and current ownership of the wells sampled is given in Table 1.

Prior to this sampling effort, groundwater quality with respect to VOCs and metals has not been evaluated in the Old Bisbee area. The six wells in Tombstone Canyon were chosen for sampling because they were most likely to contain contaminants introduced by the smelting process. Additional factors used in selecting these wells for sampling were:

1. Proximity to the smelter site
2. Known construction parameters
3. The presence of a dedicated submersible pump and
4. Ease of access.

Listed below are the wells that were sampled, well owners or operators, and the rationale for their selection.

1) (D-23-24)9ccb, Inn at Castle Rock
This well is privately owned by the Inn at Castle Rock and is within 2000 feet of the former smelter site. The well is hand-dug and uncased. Since the well is not equipped with a submersible pump, it was sampled with a bailer. The well was not purged prior to sampling. Access to the site is not restricted.

2) (D-23-24)8bda, A. Edwards
Located 1 mile to the northwest of the former smelter site,

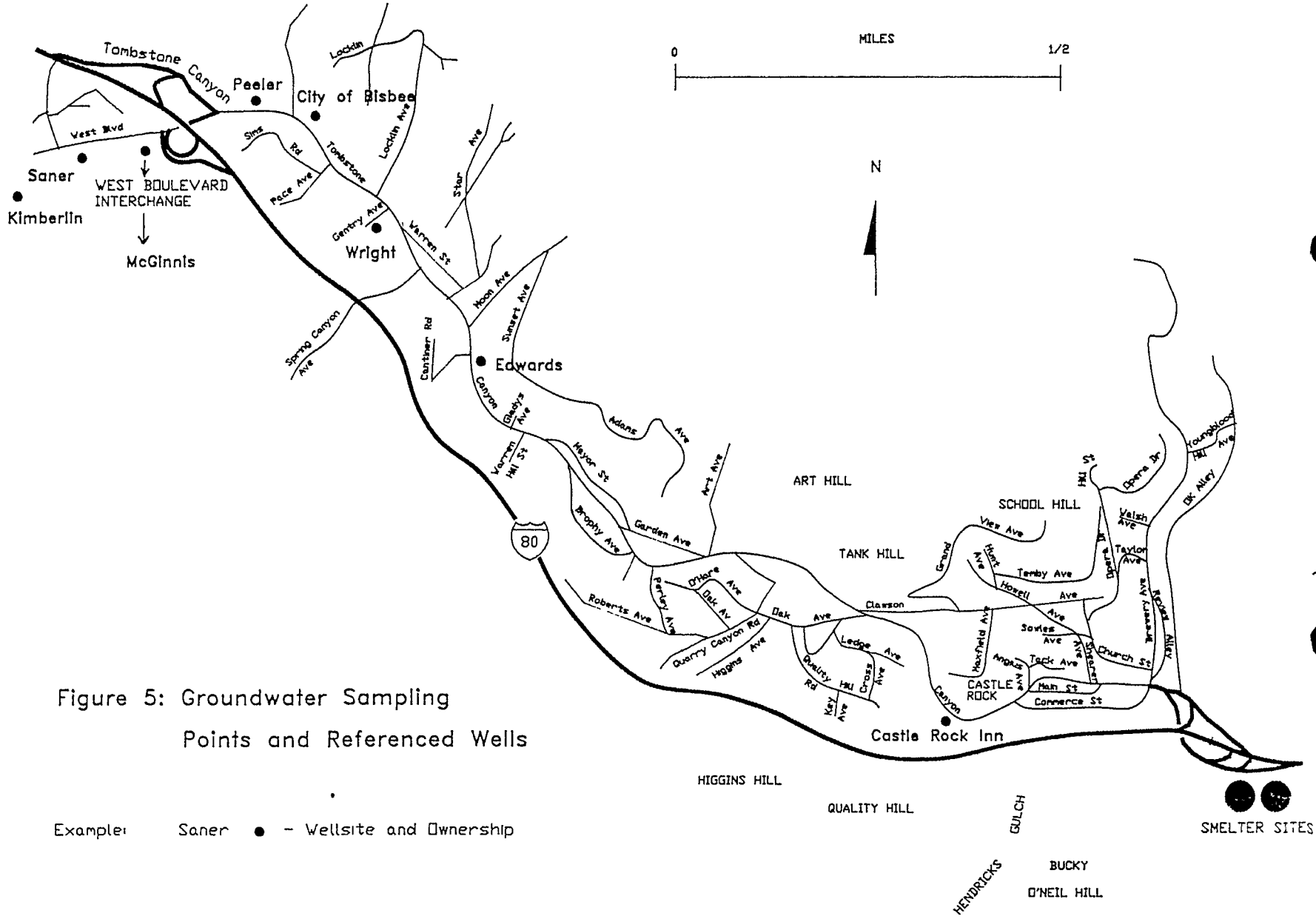

Figure 5: Groundwater Sampling Points and Referenced Wells

Example: Saner ● - Wellsite and Ownership

this domestic well was chosen for sampling based on: proximity to the site, known construction parameters, an installed submersible pump, and ease of access. The water is used primarily for lawn irrigation and washing automobiles.

3) (D-23-24)8bab1, City of Bisbee
This well is owned by the City of Bisbee and is used for fire training. A former use was to fill the city swimming pools. Construction parameters are known and the well is equipped with an external turbine pump. The wellsite is located about 1 1/3 miles northwest of the former smelter and is easily accessible.

4) (D-23-24)bab2, G. Wright
This domestic well was chosen for sampling based on the presence of a submersible pump, known construction parameters, proximity to the smelter site and ease of access to the wellhead. The well is used primarily for lawn irrigation but may have once provided drinking water.

5) (D-23-24)7aba, L. Saner
This well was substituted for the McGinnis well which was inoperable. The owner of the well uses the water for drinking and lawn irrigation. The well is equipped with a submersible pump.

6) (D-23-24)7abb, B. Kimberlin
This domestic well was chosen to represent background, ambient groundwater conditions. It is equipped with a submersible pump and is easily accessible. The residents use the water for drinking purposes and lawn irrigation. Construction data for the well was provided by Ms. Saner who owns the property.

The dissolved metals analysis was selected instead of total metals to more closely define actual groundwater conditions in terms of metal concentrations. This procedure is necessary since many wells in the Bisbee area are hand-dug and contain metal grates, rusted steel casing and 60 to 70-year old downhole pump assemblies. Also, most of the wells are poorly developed and seldom used which encourages a high degree of turbidity and particulate matter. By filtering the water, metal shavings, rust, turbidity and particulates to which metal ions can adsorb are removed. After the well-specific idiosyncrasies are removed by filtering, actual groundwater conditions can be verified and data from different wells can be reliably correlated. All samples were filtered except the Kimberlin well sample.

4.4 Analytical Results

Both the soil and groundwater sample sets were analyzed by the EPA Region IX Laboratory in Las Vegas, Nevada. A review of the analytical data was conducted by ICF Kaiser Engineers, Inc., and their findings were submitted to the EPA Region IX on January 5,

1990. A Copy of the Data Validation Report (DVR) for the soils analyses is included in Appendix D. The DVR for the groundwater samples is given as Appendix E. The following sections of this report (4.4.1 and 4.4.2) are a discussion of the analytical results of sampling by ADEQ.

4.4.1 Soil Analyses

A total of 22 soil samples were collected in or near the town of Old Bisbee and submitted to the Region IX Lab for RAS (Routine Analytical Services) metals analysis. The analytical results, instrument detection limits (IDL), contract required quantification limits (CRQL), and data qualifications as given in the DVR are presented in Table 4. Also included in Table 4 are the HBGLs for each metal analyte. It has been shown that ingestion or inhalation of metallic particulates deposited by smelters in air, dust, and soil may cause increased heavy metal absorption by children **(14)**. Since lead was previously reported in the soil at concentrations above the HBGL (400 mg/kg) by the DDP, it was the principal metal of interest in this round of sampling by ADEQ. Soil lead values were confirmed to be high in the area of the old smelter and also in some areas of residential Bisbee (See Table 4).

A maximum concentration of 4590 mg/kg soil lead was detected in sample #9 (Control #LV924-39SB) from Bucky O'Neil Hill. (Fig.3) Other samples from the vicinity of the historic smelter site contained lead in concentrations of 3290 mg/kg (2 samples; #8, LV924-38SB and #2, LV924-31SB) and 856 mg/kg (#1; LV924-30SB). Anomalous "hot spots" of lead contamination were observed in samples 19 (LV924-49) and 21 (LV-924-51) on Ledge Avenue and Castle Rock, respectively. The high lead concentrations may be due in part to emissions from a small smelter that was located near the base of Castle Rock in 1878. The contamination may also be due to paint flakes from abandoned buildings.

There may be an alternative explanation for the inconsistent soil lead results. Instead of an anomalous increase in the concentration gradient represented by samples 19 and 21, the concentrations of lead reported in samples sites #5 (LV924-35SB) and #10 (LV924-40SB) may represent false negatives. In this case, the soil lead concentration of samples 5 and 10 (426 mg/kg and 737 mg/kg, respectively) may have been artificially lowered by the addition of uncontaminated soil. Therefore, the reported soil lead concentration for samples 19 and 21 would represent the actual concentration gradient. Further sampling may be necessary to more accurately define soil conditions in this area.

It should also be noted, however, that the reported soil lead concentrations are considered estimates by ICF Kaiser Engineers, Inc. because of ICP serial dilution problems in the laboratory. The values are, consequently, flagged as "J" in Table 4.

TABLE 4: ANALYTICAL RESULTS;
METALS IN SOIL
(RESULTS IN MG/KG)

SAMPLE LOCATION		PDS-001		PDS-002		PDS-003		PDS-004		PDS-005		PDS-006		PDS-007		PDS-008		PDS-009	
SAMPLE ID		LV924-30SB		LV924-31SB		LV924-33SB		LV924-34SB		LV924-35SB		LV924-36SB		LV924-37SB		LV924-38SB		LV924-39SB	
PARAMETER	HBGL MG/KG	RESULT	VALID	RESULT	VALID	RESULT	VALID	RESULT	VALID	RESULT	VALID	RESULT	VALID	RESULT	VALID	RESULT	VALID	RESULT	VALID
ALUMINUM	1500.0	11100	J	7910	J	2970	J	4330	J	16400	J	3930	J	4330	J	22800	J	11200	J
ANTIMONY	280.0	7.7	UJ	8.3	JU	6.1	UJ	6.8	UJ	6.6	UJ	6.1	UJ	6.2	JL	11.2	JL	12.2	JL
ARSENIC	1000.0	57 50	J	32.00	J	5.80	J	2.50	J	49.70	J	9.70	J	5.50	J	19.90	J	19.30	J
BARIUM	100000	85.2	J	154	J	52.7	J	182	J	114	J	155	J	97.8	J	349	J	130	J
BERYLLIUM	0.14	1.00	JL	1.10	JL	0.20	U	0.43	JL	0.95	U	1.20		0.89	JL	2.10		1.10	
CADMIUM	100.0	17.1	J	14.0	J	1.7	J	2.5	J	7.2	J	2.9	J	2.6	J	25.3	J	11.1	J
CALCIUM	--	159000	J	117000	J	1340	J	7760	J	91300	J	1210	J	828	JL	32500	J	111000	J
CHROMIUM	2000	22.2		28 9		7.6	J	10.4	J	19.5		5.8	J	8 6	J	41.7		20 3	
COBALT	14	30.5		22.4		2.0		17.4		12.0		12.9		10.0	JL	15.5		8.6	JL
COPPER	26000	9880		9370		289		296		6120		738		341		7460		3190	
IRON	--	35800		49500		18700		24800		26100		12800		18500		44900		42100	
LEAD	400	856	J	3290	J	89.1	J	179	J	426	J	123	J	113	J	3290	J	4590	J
MAGNESIUM	--	8880	J	10200	J	1880	J	2740	J	36100	J	1900	J	2560	J	12000	J	25100	J
MANGANESE	--	3160	J	4460	J	206	J	1210	J	1140	J	1490	J	969	J	13900	J	7820	J
MERCURY	40.0	0.4		0.5		0.20	U	0.4		1.1		0.2	U	0.4		0.4		0.5	
NICKEL	3000	36 0		37.7		6.1	U	12.2		15.3		15.6		10.0		87.1		43.5	
POTASSIUM	--	1140	JL	1260	JL	742	JL	1990		1040	JL	1170		1140		2070		1460	
SELENIUM	900.0	3.9	J	2.5	J	0.4	UJ	0.5	UJ	5.0	J	0.6	JL	0.4	UJ	1.9	J	0.6	JL
SILVER	1000	6.5		7 0		1.0	U	1.3	JL	5.3		1.0	U	1.0	U	9.2		12.8	
SODIUM	--	455	JL	429	JL	317	JL	509	JL	416	JL	305	JL	297	JL	367	JL	374	JL
THALLIUM	260 0	0.7	JL	0.8	JL	0.4	U	0.5	U	0.4	U	0.4	U	0.4	U	0.4	U	0.4	U
VANADIUM	140	18.8		50.7		6.2	JL	7.6	JL	23.6		4.9	JL	5.3	JL	68.1		40.2	
ZINC	100000	978	J	1570	J	63.7	J	156	J	496	J	202	J	127	J	2720	J	1520	J
% SOLIDS		78.2		72.3		98.6		87.7		91.2		97.6		97.0		93.3		93.6	

NOTES:
VALID--VALIDITY--REFER TO DATA QUALIFIERS IN TABLE 4A; APPENDIX D
HBGL--HEALTH BASED GUIDANCE LEVEL FOR CONTAMINANTS IN SOIL
MDL--METHOD DETECTION LIMIT FOR SOIL
BG--BACKGROUND
CRQL--CONTRACT REQUIRED QUANTITATION LIMIT

TABLE 4: ANALYTICAL RESULTS;

METALS IN SOIL (Page 2)

(RESULTS IN MG/KG)

SAMPLE LOCATION		PDS-010		PDS-011		PDS-012		PDS-013		PDS-014		PDS-015		PDS-016		PDS-017		PDS-018	
SAMPLE ID		LV924-40SB		LV924-41SB		LV924-42SB		LV924-43SB BG		LV924-44SB		LV924-45SB		LV924-46		LV924-47		LV924-48	
PARAMETER	HBGL MG/KG	RESULT	VALID	RESULT	VALID	RESULT	VALID	RESULT	VALID	RESULT	VALID	RESULT	VALID	RESULT	VALID	RESULT	VALID	RESULT	VALID
ALUMINUM	1500.0	10400	J	20900	J	5230	J	5960	J	4430	J	4060	J	7780	J	19500	J	14500	J
ANTIMONY	280.0	6.7	UJ	6.6	UJ	7.0	UJ	6.7	UJ	6.8	UJ	7.2	UJ	6.4	UJ	6.5	UJ	6.5	JU
ARSENIC	1000.0	9.00	J	5.60	J	4.10	J	1.50	JL	1.80	JL	8.10	J	13.00	J	6.00	J	10 80	J
BARIUM	100000	250	J	169	J	115	J	91.2	J	92.2	J	102	J	153	J	176	J	111	J
BERYLLIUM	0.14	1.40		2.10		0.65	JL	0.85	JL	1.00	JL	1.20		1.00	JL	2.90		1.70	
CADMIUM	100.0	13.3	J	6.6	J	2.0	J	2.0	J	1.3	J	1.3	J	5.0	J	1.5	J	4.1	J
CALCIUM	--	45600	J	52200	J	1990	J	773	JL	642	JL	471	JL	1930	J	5410	J	65800	J
CHROMIUM	2000	22.7		30.4		8.0	J	10.5	J	9.4	J	5.6	J	14.9		23.7		23.9	
COBALT	14	12.6		13.4		6.0	JL	11.3		7.3	JL	6.3	JL	14.3		18.4		13.6	
COPPER	26000	863		2020		364		56.3		70.8		305		370		78.3		631	
IRON	--	22900		30000		10700		16100		15600		14400		19300		33200		31400	
LEAD	400	737	J	598	J	58.6	J	49.1	J	69.5	J	148	J	263	J	134	J	264	J
MAGNESIUM	--	5870	J	32500	J	2120	J	3200	J	1860	J	1740	J	3490	J	24500	J	16500	J
MANGANESE	--	11700	J	12100	J	2140	J	1400	J	991	J	976	J	3110	J	2640	J	1830	J
MERCURY	40.0	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U
NICKEL	3000	69.8		71.9		16.2		16.4		9.1		7.2	U	20.5		32.3		18.9	
POTASSIUM	--	2200		3060		2020		1310		1610		1500		2290		2230		1320	
SELENIUM	900.0	0.5	UJ	0.7	JL	0.5	UJ	0.5	UJ	0.5	UJ	0.5	UJ	0.6	JL	0.4	UJ	0.6	JL
SILVER	1000	4.9		5.0		1.2	JL	1.1	U	1.1	U	1.2	U	2.1		1.1	U	3.2	
SODIUM	--	387	JL	316	JL	413	JL	351	JL	352	JL	326	JL	355	JL	311	JL	426	JL
THALLIUM	260.0	0.5	U	0.4	U	0.5	U	0.5	U	0.5	U	0.5	U	0.4	U	0.4	U	0.4	J
VANADIUM	140	42.9		42.7		8.4	JL	5.4	JL	9.0	JL	5.1	JL	13.8		23.0		18.9	
ZINC	100000	834	J	800	J	71.3	J	117	J	61.4	J	72.9	J	198	J	594	J	344	J
% SOLIDS		89.8		90.6		86.3		89.2		88.7		83.7		93.2		93.0		91.8	

TABLE 4: ANALYTICAL RESULTS;

METALS IN SOIL (Page 3)

(RESULTS IN MG/KG)

SAMPLE LOCATION		PDS-019		PDS-020		PDS-021		PDS-022		Method Blan		Method Blan		MDL		CRQL	
SAMPLE ID		LV924-49		LV924-50		LV924-51		LV924-52		Lab Blank 1		Lab Blank 2					
PARAMETER	HBGL MG/KG	RESULT	VALID	RESULT	VALID	RESULT	VALID	RESULT	VALID	RESULT	VALID	RESULT	VALID	RESULT	VALID	RESULT	VALID
ALUMINUM	1500.0	9970	J	4740	J	9800	J	5720	J	18.3	JL	13.7	JL	1.0		40.0	
ANTIMONY	280.0	7.1	JU	6.5	JU	10.6	JU	6.1	UJ	6.0	U	6.0	U	6.0		12.0	
ARSENIC	1000.0	22.70	J	16.40	J	43.30	J	12.00	J	0.40	U	0.40	U	0.40		2.00	
BARIUM	100000	315	J	111	J	278	J	98.5	J	1.0	U	1.0	U	1.0		40.0	
BERYLLIUM	0.14	0.83	JL	0.93	JL	0.78	JL	0.65	JL	0.20	U	0.20	U	0.20		1.00	
CADMIUM	100.0	4.8	J	3.3	J	19.5	J	1.5	J	1.0	U	1.0	U	1.0		1.0	
CALCIUM	--	55700	J	3060	J	55300	J	1010	JL	85.9	JL	40.0	U	40.0		1000	
CHROMIUM	2000	19.2		8.5	J	21.6		12.9		1.5	JL	2.4		1.0		2.0	
COBALT	14	7.7	JL	17.2		21.0		7.6	JL	2.0	U	2.0	U	2.0		10.0	
COPPER	26000	624		767		7170		512		3.8	JL	1.0	U	1.0		5.0	
IRON	--	22100		20700		33900		17700		10	U	12.8	JL	10		20.0	
LEAD	400	828	J	187	J	1240	J	188	J	10	U	10	U	10		1.0	
MAGNESIUM	--	11100	J	2910	J	9220	J	2650	J	40.0	U	40.0	U	40.0		1000	
MANGANESE	--	5160	J	1640	J	4900	J	1150	J	7.1		2.1	JL	1.0		3.0	
MERCURY	40.0	0.4		0.2	U	0.7		0.20	U	0.15	U	0.15	U	0.1		0.10	
NICKEL	3000	35.0		14.0		33.9		13.2		6.0	U	6.0	U	6.0		8.0	
POTASSIUM	--	2340		1520		1620	JL	1480		20.0	U	20.0	U	20		1000	
SELENIUM	900.0	0.7	JL	1.0	JL	4.6	J	0.4	UJ	0.40	U	0.40	U	0.40		1.0	
SILVER	1000	2.6		1.1	U	5.3		1.0		1.6	JL	1.0	U	1.0		2.0	
SODIUM	--	390	JL	317	JL	734	JL	307	JL	20.0	U	20.0	U	20.0		1000	
THALLIUM	260.0	0.5	U	0.4	U	0.9	JL	0.4	U	0.40	U	0.40	U	0.40		2.0	
VANADIUM	140	27.6		5.7	JL	25.7		16.4		1.0	U	1.0	U	1.0		10.0	
ZINC	100000	670	J	208	J	1270	J	182	J	1.3	JL	1.2	JL	1.0		4.0	
% SOLIDS		84.0		92.7		56.5		98.6		--		--					

Increased absorption of arsenic by children living in smelter towns has also been documented **(14)**, but the Bisbee children that were tested did not exhibit arsenic concentrations in blood or urine samples that were above normal. The maximum soil arsenic reported from the current round of sampling was 57.7 mg/kg in sample LV924-30SB. Although this concentration does not exceed the HBGL for arsenic (1000 mg/kg), the data may be misleading. In the DVR by ICF Kaiser Engineers, it is stated that the matrix spike recovery results did not meet the criteria for accuracy and false negatives may exist, therefore, the data are considered estimates and are useful for limited purposes only. The results are flagged as "J" in Table 4.

The aluminum concentration in all samples exceeded the HBGL of 1500 mg/kg. The maximum reported concentration was 22,800 mg/kg in sample LV924-38SB. According to the DVR, however, the results are not considered quantitative because laboratory duplicate results did not meet the criteria for precision. Since the data are considered estimates, they are also flagged "J" in Table 4.

The aforementioned problems with the data also apply to the reported concentrations for cadmium, antimony, selenium, zinc and chromium. Because of laboratory problems, the presented data may not be representative of actual soil conditions.

4.4.2 Groundwater Analyses

A total of ten water samples including three blanks and a duplicate were submitted to the EPA Region IX Laboratory for analysis of VOCs. Although contaminants were detected in some samples, no contaminant was present in a concentration that exceeded Federal or State MCLs. Also, the reported contaminants (methylene chloride and chloroform) were also detected in the blanks which suggests contamination occurred in the laboratory. The results are considered estimates and are flagged "J" in the ICF Kaiser Engineers Inc. DVR for groundwater. Table 5 gives VOC concentrations in the samples, detection limits, Federal MCLs, and data qualifiers.

Eleven groundwater samples were submitted for analysis of dissolved metals to the EPA Region IX Lab. This total includes 2 field blanks, 2 equipment blanks and 1 duplicate sample. None of the samples contained metals in concentrations that exceeded Federal MCLs. The Castle Rock sample (LV924-15), however, contained selenium at 18.1 ug/l which exceeds the present State MCL of 10.0 ug/l. No data qualifier was placed on the reported selenium concentration in this sample by ICF Kaiser Engineers.

Also, as stated in the DVR, the reported concentrations of silver in all of the samples are considered estimates because of matrix spike recovery problems. According to the DVR, these accuracy problems may result in false negatives and the data is,

TABLE 5: ANALYTICAL RESULTS; VOCS IN GROUNDWATER (RESULTS IN MG/L)

SAMPLE LOCATION															
SAMPLE I.D.		LV924-01 D1		LV924-02		LV924-03 BG		LV924-04		LV924-05		LV924-06 FB		LV924-07	
COMPOUND	FEDERAL MCL	RESULT	VALID	RESULT	VALID	RESULT	VALID	RESULT	VALID	RESULT	VALID	RESULT	VALID	RESULT	VALID
VOLATILES															
METHYLENE CHLORIDE	--	1	U	1	JU	1	JU	1	JU	1	JU	0.6	J	1	U
CHLOROFORM	100	1	U	1	U	1	U	1	U	1	U	0.5	J	1	U

SAMPLE LOCATION								METHOD BLANK		METHOD BLANK		METHOD BLANK			
SAMPLE I.D.		LV924-08 AB		LV924-09 D1		LV924-10 FB		VBLK1		VBLK2		VBLK3		CRQL	
COMPOUND	FEDERAL MCL	RESULT	VALID	RESULT	VALID	RESULT	VALID	RESULT	VALID	RESULT	VALID	RESULT	VALID	RESULT	VALID
VOLATILES															
METHYLENE CHLORIDE	--	1	U	1	U	1	U	1	U	1	U	1	U	1	
CHLOROFORM	100	0.4	J	1	U	0.4	J	1	U	1	U	1	U	1	

*THE OTHER REQUESTED ANALYTES WERE ANALYZED FOR, BUT "NOT DETECTED." THE SAMPLE QUANTITATION LIMITS ARE LISTED IN TABLE 5A, APPENDIX E.

NOTES:

VAL--VALIDITY--REFER TO DATA QUALIFIERS IN TABLE 5B, APPENDIX E.
CRQL--CONTRACT REQUIRED QUANTITATION LIMITS
NA--NOT ANALYZED
D1, D2, ETC.--FIELD DUPLICATE PAIRS
FB--FIELD BLANK, EB--EQUIPMENT BLANK, TB-TRAVEL BLANK
BG--BACKGROUND SAMPLE

therefore, useful for limited purposes only. The concentrations, HBGLs, detection limits and data qualifiers for the metals in groundwater analysis are given in Table 6.

5.0 Emergency Response Considerations

The EPA is authorized under the National Contingency Plan [40CFR 300.415(b)(2)] to consider emergency response actions at sites which pose an imminent threat to the environment or human health. However, there is no apparent need for emergency actions at the PDHS site at this time. Removal of the soil from the steep slopes above the smelter site would encourage mass wasting processes and erosion of the remaining topsoil. Although high soil lead concentrations are located near the town of Bisbee on Bucky O'Neil and Queen Hills, the area is fenced and marked with "No Trespassing" signs and do not pose a threat to the public.

6.0 Summary of HRS Considerations

The PDHS site is located at the mouth of Brewery Gulch along U.S. Highway 80 in Bisbee, Arizona. The geographic location of the site is the SE 1/4, SE 1/4, SW 1/4 Section 9, Township 23S, Range 24E [(D-23-24)9cdb]. The site consists of two abandoned smelter sites located approximately 1200 and 1500 feet, respectively, east of the entrance to the Copper Queen Mine. The smelters were used from 1880 to July, 1904 to refine oxide ores of copper, lead, arsenic, antimony and other heavy metals.

Emissions to the air of metal particulates from the smelters may be responsible for elevated soil lead concentrations in the Bisbee area. Further, ingestion or inhalation of dust of these particulates, notably lead, is thought to be responsible for elevated metal concentrations in the blood of children. A study conducted by the DDP showed that children living in smelter towns are more likely to have high levels of lead in their blood as opposed to children who live in non-smelter towns. The DDP study was expanded to Bisbee in October and November of 1985. Results of the study indicated that four children from the Bisbee area had blood lead concentrations that exceeded 25 ug/100 ml.

As part of a follow-up study by the DDP, soil samples were collected from Old Bisbee and the surrounding communities in 1986. From a total of 75 soil samples, lead was detected from a maximum concentration of 1648 ug/g to less than 50 ug/g with a median concentration of 216 ug/g. The HBGL for lead in soil is 400 ug/g. Although lead soil concentrations above the HBGL were reported, sampling locations were not precisely documented. The DDP concluded that the high concentrations of lead in the soils from Old Bisbee could be attributed to smelting activities conducted from 1878 to 1904 or to peeled lead-based paint from abandoned structures.

TABLE 6: ANALYTICAL RESULTS;
METALS IN GROUNDWATER
(RESULTS IN UG/L)

DATE SAMPLED		10/05/89		10/05/89		10/05/89		10/05/89		10/06/89		10/06/89		10/06/89		10/06/89	
SAMPLE I.D.		LV924-15 D1		LV924-16 D1		LV924-17		LV924-18 BG		LV924-19		LV924-20		LV924-21 FB		LV924-22 EB	
PARAMETER	HBGL (ug/l)	RESULT	VALID	RESULT	VALID	RESULT	VALID	RESULT	VALID	RESULT	VALID	RESULT	VALID	RESULT	VALID	RESULT	VALID
ALUMINUM	73	135	JL	136	JL	112	JL	119	JL	122	JL	138	JL	5.0	U	5.0	U
ANTIMONY	14	30.0	U	30.0	U	30.0	U	30.0	U	30.0	U	30.0	U	30.0	U	30.0	U
ARSENIC	50	2.0	U	2.0	U	2.0	U	2.0	U	2.0	U	2.0	U	2.0	U	2.0	U
BARIUM	5000	84.70	JL	85.4	JL	51.3	JL	209.0		89.9	JL	436.0		5.0	U	5.0	U
BERYLLIUM	0.007	1.00	U	1.0	U	1.0	U	1.0	U	1.0	U	1.0	U	1.0	U	1.0	U
CADMIUM	5.0	5.00	U	5.0	U	5.0	U	5.0	U	5.0	U	5.0	U	5.0	U	5.0	U
CALCIUM	--	76000		76600		62300		67600		68300		77700		200	U	200	U
CHROMIUM	100	5.0	U	5.0	U	5.0	U	5.0	U	5.0	U	5.0	U	5.0	U	5.0	U
COBALT	0.70	10.0	U	10.0	U	10.0	U	10.0	U	10.0	U	10.0	U	10.0	U	10.0	U
COPPER	1300	5.0	U	5.0	U	5.0	U	5.0	U	5.0	U	21.7	JL	5.0	U	5.0	U
IRON	--	50.0	U	50.0	U	115.0		50.0	U	84.8	JL	50.0	U	50.0	U	50.0	U
LEAD	20	2.0	U	2.0	U	2.0	U	2.0	U	2.0	U	2.2	JL	2.0	U	2.0	U
MAGNESIUM	--	20800		21100		19400		17600		18500		29000		500	U	200	U
MANGANESE	--	126		128		11.5	JL	151		420.0		19.6		5.0	U	5.0	U
MERCURY	2.0	0.20	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U
NICKEL	150	30.0	U	30.0	U	30.0	U	30.0	U	30.0	U	30.0	U	30.0	U	30.0	U
POTASSIUM	--	3890	JL	3910	JL	5170		2870	JL	6820		3390	JL	100	U	100	U
SELENIUM	45	2.0	U	2.0	U	2.0	U	2.0	U	2.0	U	2.0	U	2.0	U	2.0	U
SILVER	50	5.0	JU	5.0	JU	5.0	JU	5.0	JU	5.0	JU	5.0	JU	5.0	JU	5.0	JU
SODIUM	--	18400		18500		17300		24900		34500		19500		100	U	100	U
THALLIUM	13	2.0	U	2.0	U	2.0	U	2.0	U	2.0	U	2.0	U	2.0	U	2.0	U
VANADIUM	7.0	5.0	U	5.0	U	5.0	U	5.0	U	5.0	U	5.0	U	5.0	U	5.0	U
ZINC	5000	5.0	U	5.0	U	23.2		1240		39.2		146.0		5.0	U	5.0	U

NOTES:

VAL-VALIDITY-REFER TO DATA QUALIFIERS IN TABLE 5B; APPENDIX E
HBGL--HEALTH BASED GUIDANCE LEVEL FOR CONTAMINANTS IN WATER
IDL-INSTRUMENT DETECTION LIMIT FOR WATERS
MDL-METHOD DETECTION LIMIT FOR SOILS
D1, D2, ETC.-FIELD DUPLICATE PAIRS
FB-FIELD BLANK, EB-EQUIPMENT BLANK, TB-TRAVEL BLANK; BG-BACKGROUND
CRQL-CONTRACT REQUIRED QUANTITATION LIMIT

TABLE 6. ANALYTICAL RESULTS;

METALS IN GROUNDWATER (PAGE 2)

(RESULTS IN UG/L)

DATE SAMPLED		10/10/89		10/10/89		10/10/89		Method Blan		IDL		CRQL	
SAMPLE I.D.		LV924-22A		LV924-23 EB		LV924-24 FB		Lab Blank					
PARAMETER	HBGL (ug/l)	RESULT	VALID	RESULT	VALID	RESULT	VALID	RESULT	VALID	RESULT	VALID	RESULT	VALID
ALUMINUM	73	188	JL	5.0	U	5.0	U	5.0	U	5.0		200.0	
ANTIMONY	14	30.0	U	30.0	U	30.0	U	30.0	U	30.0		60.0	
ARSENIC	50	2.0	U	2.0	U	2.0	U	2.0	U	2.0		10.0	
BARIUM	5000	57.2	JL	5.0	U	5.0	U	5.0	U	5.0		200.0	
BERYLLIUM	0.007	1.0	U	1.0	U	1.0	U	1.0	U	1.0		5.0	
CADMIUM	5.0	5.0	U	5.0	U	5.0	U	5.0	U	5.0		5.0	
CALCIUM	--	112000		200	U	200	U	200	U	200		5000	
CHROMIUM	100	5.0	U	5.0	U	5.0	U	5.0	U	5.0		10.0	
COBALT	0.70	10.0	U	10.0	U	10.0	U	10.0	U	10.0		50.0	
COPPER	1300	5.0	U	5.0	U	5.0	U	5.0	U	5.0		25.0	
IRON	--	100.0		50.0	U	50.0	U	50.0	U	50.0		100.0	
LEAD	20	2.0	U	2.0	U	2.0	U	2.0	U	2.0		5.0	
MAGNESIUM	--	35100		200	U	200	U	200	U	200		5000	
MANGANESE	--	13.6	JL	5.0	U	5.0	U	5.0	U	5.0		15.0	
MERCURY	2.0	0.2	U	0.2	U	0.2	U	0.2	U	0.2		0.2	
NICKEL	150	30.0	U	30.0	U	30.0	U	30.0	U	30.0		40.0	
POTASSIUM	--	2100	JL	100	U	100	U	100	U	100		5000	
SELENIUM	45	18.1		2.0	U	2.0	U	2.0	U	2.0		5.0	
SILVER	50	5.0	JU	5.0	JU	5.0	JU	5.0	U	5.0		10.0	
SODIUM	--	27400		100	U	100	U	100	U	100		5000	
THALLIUM	13	2.0	U	2.0	U	2.0	U	2.0	U	2.0		10.0	
VANADIUM	7.0	5.0	U	5.0	U	5.0	U	5.0	U	5.0		50.0	
ZINC	5000	10.4	JL	5.0	U	5.0	U	5.0	U	5.0		20.0	

Reported high concentration of lead in the soil at Bisbee prompted ADEQ to conduct a systematic sampling effort under CERCLA to assess the nature, extent and severity of soil lead contamination. The study was also conducted to gather sufficient data to make recommendations for further actions under CERCLA or other State programs if necessary.

Concentrations of lead and aluminum that were detected in soil samples collected by ADEQ exceeded the HBGLs of 400 and 1500 mg/kg, respectively. A maximum concentration of 4590 mg/kg soil lead was detected in sample #9 (Control #LV924-39SB) from Bucky O'Neil Hill. Other samples from the vicinity of the PDHS site contained lead in concentrations of 3290 mg/kg (2 samples; #8, LV924-38SB and #2, LV924-31SB) and 856 mg/kg (#1; LV924-30SB). The maximum reported concentration of aluminum was 22,800 mg/kg in sample LV924-38SB. These results, however, are considered estimates in a DVR for soil analysis by ICF Kaiser Engineers, Inc. because of problems in the laboratory.

The maximum soil arsenic reported from the current round of sampling was 57.7 mg/kg in sample LV924-30SB. Although this concentration does not exceed the HBGL for arsenic (1000 mg/kg), the data may be misleading. In the DVR, it is stated that the matrix spike recovery results did not meet the criteria for accuracy and false negatives may exist, therefore, the data are considered estimates and are useful for limited purposes only.

Groundwater samples were collected from 6 wells within the town of Bisbee and analyzed for metals and VOCs. Although contaminants were detected in some samples, no contaminant was present in a concentration that exceeded Federal or State MCLs.

A PA was prepared for the PDHS facility by the ADHS in October, 1986. Groundwater, air and additional soil sampling for heavy metal content in Bisbee was recommended. The PA was the subject of two separate evaluations by ICF Technology Inc. dated December 23, 1987 and January 19, 1988. Their review comments were forwarded to the EPA, Region IX. ICF Technology recommended no further action under CERCLA in the memo of December, 1987 and the EPA concurred. The recommendation was based on a low target population for groundwater, the lack of uses for surface water and the inability to evaluate a site based on soil conditions under the current HRS. With the proposed addition of the on-site exposure pathway in the revised HRS, however, PDHS may qualify for additional investigation under CERCLA. Also, the new HRS expands the exposure pathway for the air route to include the potential of a release to the air from contaminated soil. Concentrations of lead above the HBGL have been documented in the soil at Bisbee. Because of potential adverse environmental impact and the revised eligibility of the site for further action under CERCLA, an SI was conducted by ADEQ.

Based on the findings presented in this SI report, the potential of lead particulates being dispersed in windblown dust, a potential high target population for a release to the air, and the high potential for direct contact from the soil, the site appears to be eligible for further consideration under CERCLA. Additional soil sampling may be necessary to better define the severity of lead contamination of the soil within Bisbee, including documented "hot spots". Any sampling program should be designed to assess soil conditions of all areas within Bisbee, especially areas frequented by small children.

7.0 ADEQ Management Review/Concurrence

Judy Heywood — Signature — 8/24/91 — Date

M. D. Williams — Signature — 9/17/91 — Date

8.0 EPA Concurrence

	Initial	Date
No Further CERCLA Action	_____	_____
Listing Site Inspection	_____	_____

Notes:

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Appendix A

Contact Log And Reports

CONTACT LOG

Facility Name: PD Historical Smelter
EPA ID# : AZD981680242
State ID# : 22

Name	Affiliation	Phone #	Date	Information
Al Rand	Arizona Water Company	432-5321	9/16/88	See Contact Report
Arnold Nanez	Cochise County Department of Health Services	432-5471 Ext. 471	9/16/88	" " "
Steve Eady	Phelps Dodge Corporation	432-5342	9/16/88	" " "

CONTACT REPORT

AGENCY/AFFILIATION: Arizona Water Company		
DEPARTMENT:		
ADDRESS/CITY: 44 Main Street, Box AW, Bisbee		
COUNTY/STATE/ZIP: Cochise County, Arizona, 85603		
CONTACT(S)	**TITLE**	**PHONE**
1. Al Rand	Division Manager	(602) 432-5321
2.		
ADEQ PERSON MAKING CONTACT: Dan Williams, Hydrology		**DATE:** 9/16/88
SUBJECT: Public water supply and distribution		
SITE NAME: PD Historical Smelter		**EPA ID#:** AZD981680242

DISCUSSION:
Mr. Rand informed me that drinking water is distributed to the citizens of Bisbee via pipeline from a well field located near Naco, Arizona. The wells are approximately 9 miles to the south of Bisbee. Before distribution, the water is chlorinated and fluoridated. The static water level of the wellfield is approximately 40 feet below land surface. Mr. Rand suggested that I get in touch with Steve Eady, geologist at Phelps Dodge Corporation, for more information regarding the local hydrogeology and geology.

CONTACT REPORT

AGENCY/AFFILIATION: Cochise County Department of Health Services		
DEPARTMENT: Sanitation		
ADDRESS/CITY: Drawer 1858, Bisbee, Arizona		
COUNTY/STATE/ZIP: Cochise County, Arizona 85603		
CONTACT(S)	**TITLE**	**PHONE**
1. Arnold Nanez	Supervising Sanitarian	432-5471, Ext 471
2.		
ADEQ PERSON MAKING CONTACT: Dan Williams, Hydrology		**DATE:** 9/16/88
SUBJECT: Domestic wells in Bisbee		
SITE NAME: PD Historical Smelter		**EPA ID#:** AZD981680242

DISCUSSION:
Mr. Nanez, at my request, provided a tour of Old Bisbee and assisted in locating domestic wells within the town. He said that the County Health Department does not rotinely sample the wells, but if the owner requests a test for coliform bacteria, the Department will collect a sample and run the test. We spoke with the owners of 7 wells and they were all agreeable to sampling.

CONTACT REPORT

AGENCY/AFFILIATION: Phelps Dodge Corporation		
DEPARTMENT: Exploration Development Group		
ADDRESS/CITY: Copper Queen Branch, Highway 92, Bisbee		
COUNTY/STATE/ZIP: Cochise, Arizona, 85603		
CONTACT(S)	**TITLE**	**PHONE**
1. Steve Eady	Geologist	(602) 432-5342
2. Lance Pape	Hydrogeologist	(602) 432-5342
ADEQ PERSON MAKING CONTACT: Dan Williams, Hydrology		**DATE:** 9/16/88
SUBJECT: Hydrogeology of the Bisbee area		
SITE NAME: PD Historical Smelter		**EPA ID#:** AZD981680242

DISCUSSION:
I contacted Mr. Eady from the Arizona Water Company and set up an appointment. When I arrived at PDC I was greeted by Mr. Eady and also Mr. Lance Pape, a hydrogeologist with PDC. They told me that PDC did not own any wells within the town of Bisbee. They informed me of the groundwater divide That separates the town of Bisbee and the basin-fill aquifer to the south. They introduced me to the local geology but, for propriety reasons, would not elaborate in too much detail. They requested a copy of the SI report when it was completed.

Appendix B

Support Documents For The DDP Blood Lead Survey

ARIZONA DEPARTMENT OF HEALTH SERVICES

Inter-Office Memorandum

TO: Lloyd F. Novick, M.D., M.P.H.
Director

June 24, 1986

THRU: Glyn G. Caldwell, M.D.
Assistant Director
Division of Disease Control Services

FROM: Norman J. Petersen, Manager
Office of Chronic Disease and
Environmental Health Services

John Beck
Public Health Sanitarian II

RE: Addendum to the January 24, 1985 memorandum reporting results of the lead and arsenic study in Douglas, Bisbee and Safford

Following submission of the initial report on this subject, additional analyses were performed on available data and additional investigations were conducted in the Bisbee area. These included:

1. Analyses of data from each of the three study communities to determine whether children with a positive history of pica (craving and ingestion of substances not fit for food) had higher blood lead levels than pica-negative children.

2. Analyses of data from Douglas to determine whether the distance from place of residence to the Copper Queen smelter was correlated with blood lead levels.

3. Analyses of data from each of the three study communities to determine whether blood lead levels were correlated with erythrocyte protoporphyrin (EP) levels.

4. Environmental investigations of the homes and environs of the four Bisbee children who exhibited blood lead levels in excess of 25 ug/100 ml.

A brief description of methods along with results and recommendations are presented here.

During the community surveys, the mother of each participating child was asked whether the child exhibited a craving for substances not fit for food. This question was asked because lead toxicity in children has frequently been associated with a history of pica involving ingestion of substances containing lead, such as paint chips, painted wood and dirt. Table 1 presents the results of this inquiry for Douglas, Bisbee and Safford. Only in Safford was the mean blood lead level in pica-positive children statistically significantly higher than in pica-negative children ($P < .01$).

In the 1975 study of smelter towns conducted by the Centers for Disease Control (CDC), there were no positive correlations found between history of pica and blood lead. Interestingly, the CDC study found that approximately 43% of all children gave a positive history for pica, while the overall rate for the three communities in the 1985 survey approximated only 10%. Since the pica question was designed to be asked similarly in both studies, and since there is no apparent reason for the observed difference, there is some question as to the validity of the pica responses. Consequently, these statistical analyses involving pica should be viewed with some caution.

The residence of each child participating in the Douglas survey was plotted on a map and the distance from the residence to the Copper Queen smelter was measured and converted to miles. A linear regression analysis was performed to determine whether a correlation existed between these distance values and the blood lead levels associated with these distances. The slope of the regression line was not significantly different than zero indicating that no correlation existed. In a different approach, the blood lead levels of children living less than two miles from the smelter stack were compared to the blood lead levels in children living two to five miles from the smelter. The results of this analysis are presented in the table 2 and show that both the mean and median levels in the more distant population were lower than in the population living less than two miles from the stack. However, the difference between the mean values was not statistically significant. These findings were in agreement with those of the 1975 CDC study which showed no consistant relationships between blood lead levels and distance of residence from a smelter.

In both the 1975 and 1985 surveys, blood samples were assayed for both lead and EP levels. However, because of the difficulty and expense involved in obtaining and analyzing venous blood for lead, the CDC document, "Preventing Lead Poisoning in Young Children", recommends that hematofluorometer measurements of EP be used to screen children for elevated lead levels. Using this technique, only children with EP levels of 35 ug/100 ml or more in a capillary blood sample would have venous blood drawn for a lead level determination. Several statistical analyses were performed to evaluate the effectiveness of the EP measurement as a screening technique for elevated blood lead levels in the 1985 surveys.

Of 335 blood samples, 12 showed EP levels of 35 ug/100 ml or greater. Of these 12 samples, only two showed lead levels of 25 ug/100 ml or greater for a "false positive" rate of 83%. Four of the 335 blood samples showed lead levels of 25 ug/100 ml or greater. Of these four samples, only two showed EP levels of 35 ug/100 ml or greater for a "false negative" rate 50%. These were not impressive values for a screening technique.

The paired EP and lead values were subjected to regression analysis to determine whether a correlation existed. Only in the Bisbee data did the analysis of the 60 highest lead values against paired EP values show a statistically significant positive relationship.

The parents of the four Bisbee children with blood lead levels of 25 ug/100 ml or greater were advised, by mail, to bring this information to the attention of their family physicians. In cooperation with the Cochise County Health Department, a followup visit was made to each home to identify possible sources of lead exposure.

All four families were negative for exposure to lead glazed pottery, as well as occupational or craft sources of lead. However, the dwellings of all four families showed evidence of old, peeling paint. While only one of the four children had been recorded as positive for pica during the survey visit, under more detailed questioning during the followup visit it was reported that each child had, in fact, been observed chewing on paint chips. Samples of paint chips from each dwelling and surface soil from outside each dwelling were collected and quantitatively assayed for lead in the laboratory. The results of these assays are shown in table 3.

The U.S. Consumer Product Safety Commission considers any paint with a lead content greater than 600 ug/g to be lead-based. Using this criterion, it was evident that lead-based paint was present at each dwelling. The CDC has noted that blood lead levels rise above background when soil and dust levels reach the 500-1000 ug/g range. Soil levels outside two of the four dwellings were found to be in this range. Each family was advised, by mail, of the findings related to the family residence and was urged to take remedial steps and precautions.

Natural soil in southern Arizona contains lead at levels ranging from 2-100 ug/g. The finding of levels exceeding this range at homes in Bisbee prompted additional surface soil sampling in residential areas of this community. The results of assays of these samples are shown in table 4. The lead level in all but one of the 20 samples exceeded the range of natural soils and seven samples contained lead levels in the range that could affect blood lead levels of exposed children.

Although more soil samples will be needed from neighborhoods outside of "Old Bisbee" to clarify the pattern of lead distribution in this general area, it is evident from the data in table 4 that "Old Bisbee" constitutes at least one location where surface soil has been heavily contaminated with lead. Historic records indicate that more than one smelter previously operated in the "Old Bisbee" district, which may explain the observed deposition of lead.

In an effort to determine whether these high lead levels in soil have affected the residents, the blood lead levels in residents of the "Old Bisbee" district were compared with levels in residents of "Other Bisbee" districts. The results are presented in table 5 and show that the mean and median blood lead levels were higher in residents of "Old Bisbee" than in residents of "Other Bisbee". However, the difference between the mean levels was not statistically significant.

The following recommendation has been made in writing to the Director, Cochise County Health Department:

1. Establish a continuing lead screening program for all Bisbee area children one through five years of age supported by case management, environmental assessment, public health intervention and associated laboratory services. The program should be based on guidelines contained in "Preventing Lead Poisoning in Young Children" issued by the CDC in January of 1985.

The following recommendations should be considered by the Arizona Department of Health Services:

2. Conduct additional soil sampling in Bisbee and Douglas to describe the geographic distribution of elevated lead levels and identify relationships between these distributions and present and former smelter sites.

3, Conduct range-finding soil sampling in residential areas near present or former smelter sites throughout Arizona to identify potentially hazardous lead levels.

4. Conduct additional evaluations of the EP technique for lead screening programs in Arizona to determine why results from its use in the 1985 study correlated so poorly with blood lead levels.

NJP/mg

TABLE 1

PROPORTION OF DOUGLAS, BISBEE AND SAFFORD CHILDREN

REPORTING PICA AND BLOOD LEAD LEVELS

BY PRESENCE OR ABSENCE OF PICA - 1985

	PICA POSITIVE			PICA NEGATIVE		
	n	%	MEAN LEVEL ug/100 ml	n	%	MEAN LEVEL ug/100 ml
DOUGLAS	10	8.8	11.5	104	91.2	13.1
BISBEE	16	13.9	12.2	99	86.1	12.5
SAFFORD	9	8.5	13.0 *	97	91.5	8.9

* Significantly different $P < .01$

TABLE 2

BLOOD LEAD LEVELS (ug/100ml) IN

DOUGLAS CHILDREN BY DISTANCE FROM

SMELTER STACK - 1985

	0 - 2 MILES	2 - 5 MILES
NUMBER OF SAMPLES	40.0	74.0
MEAN	13.7	12.7
MEDIAN	13.4	12.2
S.D.	4.5	3.9
RANGE	6.0 - 24.8	6.1 - 21.3

TABLE 3

LEAD LEVELS IN PAINT AND SOIL
FROM HOMES OF CHILDREN WITH
ELEVATED BLOOD LEAD LEVELS - 1985

HOME	CHILD'S BLOOD LEAD LEVEL ug/100 ml	PAINT CHIP LEAD LEVEL ug/g	SOIL LEAD LEVEL ug/g
A	43.8	4,040	550
			452
			397
B	33.0	34,157	729
		4,110	
C	29.6	2,860	420
D	26.0	1,280	335
		968	

TABLE 4

LEAD LEVELS IN BISBEE AREA SOIL - 1985

GENERAL LOCATION	SOIL LEVEL ug/g
Old Bisbee	1648
Old Bisbee	1385
Old Bisbee	1111
Old Bisbee	956
Old Bisbee	741
Old Bisbee	681
Old Bisbee	502
Old Bisbee	455
Old Bisbee	431
Old Bisbee	407
Old Bisbee	371
Bakerville	371
Old Bisbee	347
Warren	234
Old Bisbee	228
Tin Town	185
Saginaw	180
Terra Del Flores	125
Saginaw	120
Don Luis	64

TABLE 5

BLOOD LEAD LEVELS (ug/100 ml)
IN BISBEE AREA CHILDREN
BY DISTRICT OF RESIDENCE - 1985

	OLD BISBEE	OTHER BISBEE
NO. OF SAMPLES	36	79
MEAN	14.0	11.8
MEDIAN	12.3	11.5
S. DEVIATION	7.7	4.3
RANGE	3* - 26.0	3* - 43.8

* 3 is used to represent, statistically, those sample results that were below the detectable limit of 6 ug/100 ml.

ARIZONA DEPARTMENT OF HEALTH SERVICES
Inter-Office Memorandum

January 8, 1986

TO: Lloyd F. Novick, M.D., M.P.H.
Director

FROM: Norman J. Petersen
Manager, Office of Chronic Disease
and Environmental Health Services

John Beck,
Public Health Sanitarian II

THRU: Glyn G. Caldwell, M.D.
Assistant Director
Division of Disease Control Services

RE: Preliminary analyses of blood lead and urine arsenic data collected during October and November, 1985 from Children in Douglas, Bisbee, and Safford.

Between October 28 and November 16, 1985, blood and urine specimens were collected from children 1-5 years of age living in Douglas, Bisbee and Safford. Children were selected for the study using a systematic sampling procedure described in the study protocol and participation was voluntary. The study design was patterned after a similar but larger project conducted in 1975 by the Centers for Disease Control (CDC) which included the communities of Douglas and Safford. The purpose of the present study was to evaluate lead and arsenic absorption among preschool-age children in the vicinity of the Douglas smelter and to compare these observations with measurements from Bisbee and Safford. The plan also envisioned comparisons with the 1975 results from Douglas and Safford.

A zinc protoporphyrin (ZnPP) test and a hematocrit were performed as the blood samples were received in the field laboratory and before preparation for shipment. All blood and urine samples were shipped to the ADHS Laboratory in Phoenix for lead and arsenic analysis.

ZnPP was measured using a hematofluorometer calibrated to read in erythrocyte protoporphyrin (EP) equivalents.The calibration of this instrument includes an adjustment to account for the expected hematocrit range and analysis of the hematocrit data confirmed that the appropriate calibration value had been used. Quality control tests on 30 split blood samples using a different hematofluorometer in the laboratory showed excellent agreement and confirmed the validity of the field measurements. In the 1975 study EP was measured using a laboratory extraction method. Comparative studies have shown that at high values the ZnPP technique may underestimate the EP present. However, for values up to 35 ug/100ml both techniques give equivalent results.

The minimum detectable level of blood lead in analyses performed by the State Laboratory was 6ug/100ml and was comparable to the detection level in the 1975 tests. However, due to a change in methodology, recommended by the CDC reference laboratory, the State Laboratory detection limit for urine arsenic in this study was 40 ug/l compared to a reported detection limit of 1-2 ug/l in 1975. Because the majority of the arsenic values for children in this study fell below the detectable limits, they could not be readily compared with the 1975 study results.

Quality assurance samples for urine arsenic and blood lead were submitted to the CDC reference laboratory. A comparison of these split sample test results are presented in the following table and show that for both lead and arsenic, the State Laboratory measured higher mean values than did the reference laboratory. Addtional linear regression and correlation analyses showed that these differences were sufficiently consistent to permit the use of the data, even though they overestimate the levels present in the specimens.

	Blood lead ug/100ml	Urine Arsenic ug/l
No. of samples	27	11
CDC reference laboratory mean	15.3	79
State Laboratory, mean	20.3	117

A statistical summary of the blood lead results from the three study communities is presented in the following table with blood lead values expressed in ug/100ml. An elevated blood lead level is defined as a concentration of lead in whole blood of 25 ug/100ml or greater.

	Douglas	Bisbee	Safford
No. of Samples	114	115	106
Mean	13.1	12.5	9.3
Median	12.6	12.0	9.3
S. Deviation	4.1	5.7	4.3
Range	*3-24.8	*3.43.8	*3.21.4

* 3 is used to represent, statistically, those sample results that were below the detectable limit of 6 ug/100ml.

A statistical summary of blood ZnPP results as EP equivalents is presented in ug/100ml in the following table. An elevated EP level is defined as a value of 35 ug/100ml or greater.

	Douglas	Bisbee	Safford
No. of Samples	145	115	121
Mean	13	12	14
Median	11	10	13
S. Deviation	9.8	8.8	15.6
Range	0 to 43	0 to 62	0 to 153

Total urine arsenic means and medians in all three communities were below the reported limits of detectability and, therefore, could not be calculated. Increased arsenic absorption is defined by a value equal to or greater than 50 ug/l. While this value approximates the 95% percentile of the normal population, normal values can range from

10-330 ug/l because of the marked effect of dietary arsenic on total urine arsenic. In the absence of mean and median values, the 95th percentile values for the three communities are presented below in ug/l.

	Douglas	Bisbee	Safford
No. of Samples	134	108	93
95th Percentile	49	68	49

Measured values that equaled or exceeded the 50 ug/l criteria are shown below in ug/l for the three communities.

Douglas	Bisbee	Safford
55	50	67
56	80	70
60	84	71
60	91	152
130	103	
130	151	

Because efforts were made to conduct the present study in a manner similar to that used in the CDC study of 1975, and because extensive efforts were made in the area of laboratory quality assurance testing, a valid comparison of the results from the two studies seemed justified for Douglas and Safford.

Blood lead levels in ug/100ml are compared in the following table:

	Douglas		Safford	
	1975	1985	1975	1985
No. of Samples	97	114	92	106
Mean	20.5	13.1	15.3	9.3
Median	19.8	12.6	14.2	9.3
No. of Values Elevated *	15[a]	0[b]	3[a]	0[b]
% of Values Elevated	15	0	3	0

* The criteria for elevated levels of blood lead changed from 29.4 ug/100ml in 1975 to 25.0 ug/100ml in 1985.

a Values greater than 29.4 ug/100ml

b Values greater than 25.0 ug/100ml

Blood ZnPP levels as EP equivalents in ug/100ml are compared in the following table:

	Douglas		Safford	
	1975	1985	1975	1985
No. of samples	97	145	92	121
Mean	30	13	23	14
Median	24	11	20	13
No. of values elevated *	16[a]	7[b]	5[a]	3[b]
% of values elevated	16	5	5	2

* The criteria for elevated levels of EP changed from 42.7 ug/100ml in 1975 to 35 ug/100ml in 1985

a Values greater than 42.7 ug/100ml

b Values greater than 35 ug/100ml

Elevated urine arsenic levels in ug/l are compared in in the following table:

	Douglas		Safford	
	1975	1985	1975	1985
No. of samples	80	134	61	93
No. of values elevated *	12	7	4	4
% of values elevated	15	5	7	4

* For this comparison the criteria for elevated values was 45.5 ug/l for both 1975 and 1985.

In summary, the study of blood lead levels and urine arsenic levels conducted in the fall of 1985 shows little evidence of excessive exposure to these heavy metals in the communities of Douglas, Bisbee and Safford. Even with laboratory results that overstated the true values, only 4 of 335 blood samples exceeded the current CDC criteria for elevated blood lead of 25 ug/100ml and only 2, or 0.6%, the previous guidance level of 30 ug/100ml. By comparison, the Second National Health and Nutrition Examination Survey (NHANES II) estimated that during the 1976-1980 period, 3.9% of all U.S. children under 5 years of age had blood lead levels exceeding 30 ug/100ml. All 4 elevated levels were observed in Bisbee and 3 of the 4 originated in a circumscribed geographical area of that community. This finding suggests that an investigation of the environment in this area for possible sources of lead exposure is warranted.

The difference between the mean blood lead levels in Safford and Douglas was statistically significant, as was the difference between the Safford and Bisbee levels. The difference between the mean levels in Douglas and Bisbee was not statistically significant. While the effect of smelter emissions may have accounted for the higher mean blood lead level in Douglas, relative to Safford, these emissions should not have been a factor in the higher mean levels observed in Bisbee. Data collected by the CDC in populations living in smelter communities indicates that the effect of the emissions on blood lead levels is limited to a five-mile radius around a smelter. It may be worth looking for some common factor in Douglas and Bisbee, such as

elevated soil lead levels, to explain the similarity in the mean blood lead levels of the two communities.

The decrease in blood lead levels in Safford and Douglas between 1975 and 1985 was expected. The NHANES II found that between 1976 and 1980, the overall mean blood lead levels dropped from 14.6 ug/100ml to 9.2 ug/100ml, and this corresponded with a decline in sales of leaded gasoline. As measured by ZnPP, a reduction in EP levels in both Safford and Douglas between 1975 and 1985 appeared to support the observed reduction in blood lead levels in these communities. However, the differences between the mean EP levels in the three study communities were not statistically significant. In view of the significant differences in mean blood lead levels mentioned above, the EP data suggested that the ZnPP technique is not sufficiently sensitive to measure such differences and should be used only as a screening procedure.

All urine arsenic levels from the 1985 study were within the normal range and reflect an expected statistical distribution having approximately 5% of the values falling above the 95th percentile for normal populations. Although mean values could not be calculated and compared with the 1975 values, the reduction in the percent of elevated values from 15 to 5 in Douglas and from 7 to 4 in Safford was suggestive of reduced arsenic exposure in both communities.

All parents and, in those cases where requested, family physicians will be notified of the individual results obtained from specimens submitted by children in these three communities. The parents of the four children in Bisbee who showed elevated levels of blood lead will be advised to bring this information to the attention of their physicians.

NP:jb:cs

Appendix C

Analytical Results Of Soil Sampling By DDP

ARIZONA DEPARTMENT OF HEALTH SERVICES

Evan MeCham, Governor
Ted Williams, Director

Division of Disease Prevention
Office of Risk Assessment and
Investigation
431 North 24th Street
Ramada Hall
Phoenix, Arizona 85008
(602) 255-1206

January 16, 1987

Carol Mordhorst, Director
Cochise County Health Department
P.O. Box 1858
Bisbee, Arizona 85603

Dear Carol:

Attached are the results of lead assays of soil samples collected from present or former smelter or ore processing sites in Cochise County. The list includes some values for Bisbee that were sent to you at an earlier date.

Our soil sampling experience in southern Arizona indicates that lead levels in surface soil from uncontaminated sites are typically less than 50 ug/g. Therefore, we would conclude that some of the samples from Bisbee, Benson, Willcox and Douglas show evidence of lead contamination. However, only Bisbee (17 of 75, or 23%) and Douglas (4 of 47, or 9%) showed levels in or above the 500 - 1000 ug/g range that the Centers for Disease Control state might influence blood lead levels in young children.

You will note that the 47 surface soil lead levels from Douglas ranged from 1170 ug/g to less than 50 ug/g with a median value of 196 ug/g. These levels were quite similar to the 75 Bisbee values which ranged from 1648 ug/g to less than 50 ug/g with a median value of 216 ug/g. By comparison, soil lead levels in 31 samples from Safford ranged from 102 ug/g to less than 50 ug/g with a median value of less than 50 ug/g. Only seven Safford samples were above the laboratory detection level of 50 ug/g.

You may recall that the mean and median blood lead levels in children from Bisbee and Douglas were comparable while the levels in Safford were approximately 3 ug/dl lower. While these correlations may suggest an association between lead

levels in soil and blood, they do not necessarily demonstrate cause and effect. Accordingly, speculation concerning the interpretation of these data should be done with caution. The finding of four elevated blood lead levels in Bisbee and none in Douglas, a community with comparable soil lead levels, could be attributed to a higher prevalence of peeling leaded paint in Bisbee. Again, this explanation must be recognized as speculation.

Mr. Beck plans to collect samples from sites at Johnson and Cochise to complete our Cochise County survey. We will forward the results to you when they become available.

Sincerely,

Norman J. Petersen, Chief
Office of Risk Assessment and
Investigation

NJP/ts

Enclosure

cc: Glyn G. Caldwell, M.D.
John Beck

LEAD LEVELS IN SURFACE SOIL SAMPLES
FROM SELECTED AREAS OF COCHISE COUNTY

General Location	Soil Level ug/g
1. Benson	
McNeil and County Road	347
Pearl and San Pedro	109
Dragoon and Sixth	85
2. Willcox	
RR and Grant	<50
RR and Stewart	156
Maley and El Paso	94
Fremont and Bisbee	<50
3. Douglas	
Landfill Road south of Prison	237
Landfill Road south of K-Mart	58
Landfill Road south of Clay Street	575
Near Landfill	320
Landfill Road at Ninth	237
Two Blocks south of Ninth and Landfill Road	1170
North of Waste Plant	322
East of Waste Plant (500m)	283
East of Waste Plant (1000m)	274
East of Waste Plant (corral)	162
East of Custom House	104
First and E	211
First and B	196
Southwest of Calvary Cemetery	135
Southeast of Calvary Cemetery	102
South of Old Cemetery	99
Fifth and B	145
Ninth and A	186
Thirteenth and A	349
Eighteenth and A	434

3. Douglas - continued

General Location	Soil Level ug/g
Twenty-second and A	173
Twenty-first and Division	108
Twenty-second and Eddie	151
Twenty-second and Kline	74
Leslie Canyon and old RR grade	78
Leslie Canyon near Fairgrounds	<50
Leslie Canyon west of Fairgrounds	126
H and Sixteenth	161
Washington and Eighteenth	361
Washington and Pirtleville	175
North J and Pirtleville	188
Sulfur Springs and Pirtleville	208
Washington and Lawrence	144
North of Washington and Lawrence (500m)	<50
North of Washington and Lawrence (1000m)	239
Pirtleville and Cleveland	63
Pirtleville and Monroe	390
Pirtleville and 666 (eastside)	374
Pirtleville and 666 (westside)	599
Water Pump north of Smelter	320
West of Water Pump	421
North of Drive-In	301
North of Drive-In (500m west)	446
North of Drive-In (1250m west)	<50
Pirtleville Road near Clay	415
Landfill Road north of Ninth	512
Ninth and Florida	122
4. Charleston	
Highway and Railroad	60

General Location	Soil Level ug/g
5. Hereford	
Highway and Northeast of River	50
6. Bisbee	
Old Bisbee, Quality Hill	1648
Old Bisbee, Quality Hill	956
Old Bisbee, Clauson Avenue	1385
Old Bisbee, Police Station	1111
Old Bisbee, Police Station	371
Old Bisbee, Taylor	741
Old Bisbee, Tombstone Canyon	228
Old Bisbee, Tombstone Canyon	681
Old Bisbee, Tombstone Canyon	455
Old Bisbee, Tombstone Canyon	729
Old Bisbee, Tombstone Canyon (Pace Park)	126
Old Bisbee, Tombstone Canyon (Waterway)	238
Old Bisbee, Tombstone Canyon (Near Locklin)	185
Old Bisbee, Central	420
Old Bisbee, Old Bisbee High	431
Old Bisbee, Lower Brewery Gulch	502
Old Bisbee, Lower Brewery Gulch	407
Old Bisbee, Lower Brewery Gulch	347
Old Bisbee, Brewery Gulch	452
Old Bisbee, Brewery Gulch	397
Old Bisbee, Brewery Gulch	550
Old Bisbee, Brewery Gulch	415
Old Bisbee, Brewery Gulch	663
Old Bisbee, Brewery Gulch	270
Old Bisbee, Quarry Canyon (Pool Park)	624
Old Bisbee, Quarry Canyon (Dump Site)	920
Old Bisbee, Quarry Canyon (Dump Site)	505
Bakerville	196
Bakerville	483

6. Bisbee - continued

General Location	Soil Level ug/g
Bakerville	262
Bakerville	140
Bakerville	371
Warren	177
Warren	349
Warren	126
Warren	99
Warren	<50
Warren	51
Warren	121
Warren	234
Warren (Central)	335
Warren (Greenway)	<50
Warren (Ruppe)	55
Warren (Mills Field)	<50
Lowell (Waterway)	118
Lowell (School)	216
Galena	564
Galena	983
Briggs	276
South Bisbee	429
Tin Town	1200
Tin Town	185
Saginaw	180
Saginaw	120
Don Luis	64
Don Luis	296
Don Luis	210
San Jose	<50
San Jose	62

6. Bisbee - continued

General Location	Soil Level ug/g
San Jose	63
San Jose	54
Huachuca Terrace	74
Huachuca Terrace	56
Huachuca Terrace	171
Huachuca Terrace	168
Calle Cabo	71
Calle Cabo	101
Barnett Acres	72
Mt. View	72
Sunset Acres	108
Sunset Acres	53
Sunset Acres	211
Sunset Acres	74
Terra Del Flores	125
Crestview	63

Appendix D

Data Validation Report For Soil Sampling By ADEQ

File

ICF KAISER ENGINEERS

JAN 0 5 1990

ICF KAISER ENGINEERS INC
160 SPEAR STREET SUITE 1380
SAN FRANCISCO CA 94105 1535
415/957-0110

MEMORANDUM

SUBJECT: Review of Analytical Data

FROM: Santiago Lee
ESAT Senior Organic Data Reviewer
ICF Kaiser Engineers, Inc.

THROUGH: David Bingham
Environmental Scientist
Quality Assurance Management Section
Environmental Services Branch, OPM (P-3-2)

TO: Tom Mix
Project Officer
Site Evaluation Section (H-8-1)

Attached are comments resulting from Region 9 review of the following analytical data:

SITE: Phelps Dodge Douglas
EPA SITE ID NO:
CASE/SAS NO.: LV924 Memos #2 and #2A

LABORATORY: Region IX, Las Vegas
ANALYSIS: RAS metals analyses
SAMPLE NO.: 22 soil samples. See Table 1A for details.

COLLECTION DATE: October 10 and 11, 1989

REVIEWER: Santiago Lee, ICF Kaiser Engineers, Inc.
TELEPHONE NUMBER: (415) 957-0110

If there are any questions, please contact the reviewer.

Attachment

Data Validation Report

Case No.: LV924 Memos #2 and #2A
Site: Phelps Dodge
Laboratory: Region IX, Las Vegas
Reviewer: Santiago Lee,
ESAT/ICF Kaiser Engineers, Inc.
Date: December 27, 1989

22 Soil Samples
for RAS Metals

I. Introduction

Region IX Laboratory in Las Vegas received twenty-two (22) soil samples on October 12, 1989 for RAS metals analyses. Sample numbers are LV924-305B, 315B, 335B, 345B, 355B, 365B, 375B, 385B, 395B, 405B, 415B, 425B, 435B, 445B, 455B, 46, 47, 48, 49, 50, 51, and 52. The samples were collected on October 10 and 11, 1989. Sample number LV924-435B is a background sample.

The analytical results with qualifications are presented in Table 1A. This document was prepared in accordance with EPA Contract Laboratory Program Inorganic Statement of Work for July 1987 and EPA document "Laboratory Data Validation Functional Guidelines For Evaluating Inorganic Analyses" (1985).

II. Validity and Comments

A. The following results are considered usable for limited purposes because of accuracy problems. The results are considered as estimates and are flagged "J" in Table 1A.

- Antimony, arsenic, cadmium, selenium, and zinc in all of the samples

Matrix spike recovery results do not meet criteria for accuracy as listed below. The possible percent bias for each element is also presented below. Where the sample results for antimony, arsenic, cadmium, and zinc are above the method detection limit, the results are quantitatively questionable, could be biased low, and are the minimum concentration at which the parameter was present. Where the sample results for selenium are above the method detection limit, the results are quantitatively questionable, could be biased high, and are the maximum concentration at which the parameter was present. Where the sample results for antimony and selenium are undetected, the matrix spike recovery result shows a severe analytical deficiency and false negatives may exist.

Parameter	LV924-305 Soil % Recovery	LV924-305 Soil % Bias	LV924-46 Soil % Recovery	LV924-46 Soil % Bias
Antimony	45	-55	66	-34
Arsenic	---	---	72	-28
Cadmium	72	-28	---	---
Selenium	180	+80	---	---
Zinc	---	---	66	-34

B. The following results are considered usable for limited purposes because of precision problems. The results are considered as estimates and are flagged "J" in Table 1A.

- Aluminium, barium, magnesium, and manganese in all of the samples

Laboratory duplicate results did not meet criteria (35%) for precision as listed below. The results are considered quantitatively questionable. The qualitative presence of the parameter was confirmed.

Parameter	LV924-46 Lab. Dup. Soil RPD
Aluminium	44
Barium	37
Magnesium	38
Manganese	38

C. The results reported in Table 1A for the following analytes are considered as estimates (J) and usable for limited purposes only.

- All results above the method detection limit but below the contract required quantitation limit (denoted with an "L" qualifier)

Results above the method detection limit but below the contract required quantitation limit are considered qualitatively acceptable but quantitatively unreliable due to uncertainties in the analytical precision near the limit of detection.

D. The following results are considered usable for limited purposes due to possible contamination problems. The results are considered as suspects and reported as estimates with a "J" flag in Table 1A.

- Chromium in sample numbers LV924-335B, 345B, 365B, 375B, 425B, 435B, 445B, 455B, and 50

These results were detected above the method detection limit and less than five times the highest laboratory blank. Laboratory blanks which were less than the contract required quantitation

limit and less than twice the method detection limit were not used to determine contamination problems.

E. The following results are considered usable for limited purposes because of problems with the laboratory control sample (LCS). These results are considered as estimates and are flagged "J" in Table 1A.

- Magnesium in all of the samples

The laboratory control sample did not meet criteria (80-120%) as listed below.

Parameter	Soil % Recovery	Soil % Bias
Magnesium	126	+26

Where the sample results for magnesium are above the method detection limit, the results are quantitatively questionable, could be biased high, and are the maximum concentration at which the parameter was present.

F. The following results are considered usable for limited purposes because of problems with the ICP serial dilution. These results are considered as estimates and are flagged "J" in Table 1A.

- Calcium, lead, and zinc in all of the samples

The ICP serial dilution did not meet criteria (10% difference) as listed below.

Parameter	LV924-305B Soil % Difference
Calcium	11.2
Lead	11.7
Zinc	10.2

G. Due to a laboratory contamination problem, the sample detection limit for mercury has been raised to 0.2 mg/Kg by the reviewer.

H. The background sample, LV924-435B, had a number of parameters with concentration levels above the laboratory blanks.

I. The 40 CFR 136 holding times do not apply as these samples are not waters. The mercury contractual holding time was exceeded for all samples by 17 days (43 days compared to the contract holding time of 26 days). This deficiency is not expected to affect the sample results significantly. There was no other holding time problem.

J. All other results are considered valid and usable for all purposes. All QC parameters, other than those discussed here, have been met and are considered acceptable.

TABLE 4a
DATA QUALIFIERS

NO QUALIFIERS indicates that the data are acceptable both qualitatively and quantitatively.

U Indicates that the compounds is not detected above the concentration listed.

J Results are estimated and the data are valid for limited purposes. The results are qualitatively acceptable.

N Presumptive evidence of the presence of the material. The compound identification is considered to be tentative. The data are usable for limited purposes.

R Results are rejected and data are invalid for all purposes.

ANALYTICAL RESULTS
TABLE 1A .

Case No.: LV924 Memos #2 and #2A
Site: Phelps Dodge
Lab.: Region IX, Las Vegas
Reviewer: Santiago Lee, ESAT/ICF Kaiser Engineers, Inc.
Date: December 27, 1989

Analysis Type: Soil Samples for RAS Metals

Concentration in mg/Kg

Sample Location	PDS-001			PDS-002			PDS-003			PDS-004			PDS-005			PDS-006			PDS-007			PDS-008		
Sample I.D.	LV924-305B			LV924-315B			LV924-335B			LV924-345B			LV924-355B			LV924-365B			LV924-375B			LV924-385B		
Parameter	Result	Val	Com.	Result	Val	Com.	Result	Val	Com.	Result	Val	Com.	Result	Val	Com.	Result	Val	Com.	Result	Val	Com.	Result	Val	Com.
Aluminium	11100	J	b	7910	J	b	2970	J	b	4330	J	b	16400	J	b	3930	J	b	4330	J	b	22800	[redacted]	
Antimony	7.7 U	J	a	8.3 U	J	a	6.1 U	J	a	6.8 U	J	a	6.6 U	J	a	6.1 U	J	a	6.2 L	J	a	11.2 L	J	a,c
Arsenic	57.5	J	a	32.0	J	a	5.8	J	a	2.5	J	a	49.7	J	a	9.7	J	a	5.5	J	a	19.9	J	a
Barium	85.2	J	b	154	J	b	52.7	J	b	182	J	b	114	J	b	155	J	b	97.8	J	b	349	J	b
Beryllium	1.0 L	J	c	1.1 L	J	c	0.20 U			0.43 L	J	c	0.94 U			1.2			0.89 L	J	c	2.1		
Cadmium	17.1	J	a	14.0	J	a	1.7	J	a	2.5	J	a	7.2	J	a	2.9	J	a	2.6	J	a	25.3	J	a
Calcium	159000	J	f	117000	J	f	1340	J	f	7760	J	f	91300	J	f	1210	J	f	828 L	J	c,f	32500	J	f
Chromium	22.2			28.9			7.6	J	d	10.4	J	d	19.5			5.8	J	d	8.6	J	d	41.7		
Cobalt	30.5			22.4			2.0			17.4			12.0			12.9			10.0 L	J	c	15.5		
Copper	9880			9370			289			296			6120			738			341			7460		
Iron	35800			49500			18700			24800			26100			12800			18500			44900		
Lead	856	J	f	3290	J	f	89.1	J	f	179	J	f	426	J	f	123	J	f	113	J	f	3290	J	f
Magnesium	8880	J	b,e	10200	J	b,e	1880	J	b,e	2740	J	b,e	36100	J	b,e	1900	J	b,e	2560	J	b,e	12000	J	b,e
Manganese	3160	J	b	4460	J	b	206	J	b	1210	J	b	1140	J	b	1490	J	b	969	J	b	13900	J	b
Mercury	0.41			0.45			0.20 U		g	0.35			1.1			0.20 U		g	0.39			0.40		
Nickel	36.0			37.7			6.1 U			12.2			15.3			15.6			10.0			87.1		
Potassium	1140 L	J	c	1260 L	J	c	742 L	J	c	1990			1040 L	J	c	1170			1140			2070		
Selenium	3.9	J	a	2.5	J	a	0.41 U	J	a	0.46 U	J	a	5.0	J	a	0.55 L	J	a,c	0.41 U	J	a	1.9	[redacted]	
Silver	6.5			7.0			1.0 U			1.3 L	J	c	5.3			1.0 U			1.0 U			9.2		
Sodium	455 L	J	c	429 L	J	c	317 L	J	c	509 L	J	c	416 L	J	c	305 L	J	c	297 L	J	c	367 L	J	c
Thallium	0.69 L	J	c	0.75 L	J	c	0.41 U			0.46 U			0.44 U			0.41 U			0.41 U			0.43 U		
Vanadium	18.8			50.7			6.2 L	J	c	7.6 L	J	c	23.6			4.9 L	J	c	5.3 L	J	c	68.1		
Zinc	978	J	a,f	1570	J	a,f	63.7	J	a,f	156	J	a,f	496	J	a,f	202	J	a,f	127	J	a,f	2720	J	a,f
Percent Solids	78.2			72.3			98.6			87.7			91.2			97.6			97.0			93.3		

Val-Validity Refer to Data Qualifiers in Table 1B.
Com.-Comments Refer to the Corresponding Section in the Narrative for each letter.
IDL-Instrument Detection Limit for Waters, MDL-Method Detection Limit for Soils

D1, D2, etc.-Field Duplicate Pairs
FB-Field Blank, EB-Equipment Blank, TB-Travel Blank; BG-Background
CRQL-Contract Required Quantitation Limit

ANALYTICAL RESULTS
TABLE 1A

Case No.: LV924 Memos #2 and #2A
Site: Phelps Dodge
Lab.: Region IX, Las Vegas
Reviewer: Santiago Lee, ESAT/ICF Kaiser Engineers, Inc.
Date: December 27, 1989

Analysis Type: Soil Samples for RAS Metals

Concentration in mg/Kg

Sample Location	PDS-009			PDS-010			PDS-011			PDS-012			PDS-013			PDS-014			PDS-015			PDS-016		
Sample I.D.	LV924-395B			LV924-405B			LV924-415B			LV924-425B			LV924-435B BG			LV924-445B			LV924-455B			LV924-46		
Parameter	Result	Val	Com.	Result	Val	Com.	Result	Val	Com.	Result	Val	Com.	Result	Val	Com.	Result	Val	Com.	Result	Val	Com.	Result	Val	Com.
Aluminium	11200	J	b	10400	J	b	20900	J	b	5230	J	b	5960	J	b	4430	J	b	4060	J	b	7780	J	[redacted]
Antimony	12.2 L	J	a,c	6.7 U	J	a	6.6 U	J	a	7.0 U	J	a	6.7 U	J	a	6.8 U	J	a	7.2 U	J	a	6.4 U	J	a
Arsenic	19.3	J	a	9.0	J	a	5.6	J	a	4.1	J	a	1.5 L	J	a,c	1.8 L	J	a,c	8.1	J	a	13.0	J	a
Barium	130	J	b	250	J	b	169	J	b	115	J	b	91.2	J	b	92.2	J	b	102	J	b	153	J	b
Beryllium	1.1			1.4			2.1			0.65 L	J	c	0.85 L	J	c	1.0 L	J	c	1.2			1.0 L	J	c
Cadmium	11.1	J	a	13.3	J	a	6.6	J	a	2.0	J	a	2.0	J	a	1.3	J	a	1.3	J	a	5.0	J	a
Calcium	111000	J	f	45600	J	f	52200	J	f	1990	J	f	773 L	J	c,f	642 L	J	c,f	471 L	J	c,f	1930	J	f
Chromium	20.3			22.7			30.4			8.0	J	d	10.5	J	d	9.4	J	d	5.6	J	d	14.9		
Cobalt	8.6 L	J	c	12.6			13.4			6.0 L	J	c	11.3			7.3 L	J	c	6.3 L	J	c	14.3		
Copper	3190			863			2020			364			56.3			70.8			305			370		
Iron	42100			22900			30000			10700			16100			15600			14400			19300		
Lead	4590	J	f	737	J	f	598	J	f	58.6	J	f	49.1	J	f	69.5	J	f	148	J	f	263	J	f
Magnesium	25100	J	b,e	5870	J	b,e	32500	J	b,e	2120	J	b,e	3200	J	b,e	1860	J	b,e	1740	J	b,e	3490	J	b,e
Manganese	7820	J	b	11700	J	b	12100	J	b	2140	J	b	1400	J	b	991	J	b	976	J	b	3110	J	b
Mercury	0.54			0.22 U		g	0.22 U		g	0.23 U		g	0.22 U		g	0.23 U		g	0.24 U		g	0.21 U		
Nickel	43.5			69.8			71.9			16.2			16.4			9.1			7.2 U			20.5		
Potassium	1460			2200			3060			2020			1310			1610			1500			2290		[redacted]
Selenium	0.62 L	J	a,c	0.45 U	J	a	0.66 L	J	a,c	0.46 U	J	a	0.45 U	J	a	0.45 U	J	a	0.45 U	J	a	0.48 U	J	a	0.56 L	J	a,c
Silver	12.8			4.9			5.0			1.2 L	J	c	1.1 U			1.1 U			1.2 U			2.1		
Sodium	374 L	J	c	387 L	J	c	316 L	J	c	413 L	J	c	351 L	J	c	352 L	J	c	326 L	J	c	355 L	J	c
Thallium	0.43 U			0.45 U			0.44 U			0.46 U			0.45 U			0.45 U			0.48 U			0.43 U		
Vanadium	40.2			42.9			42.7			8.4 L	J	c	5.4 L	J	c	9.0 L	J	c	5.1 L	J	c	13.8		
Zinc	1520	J	a,f	834	J	a,f	800	J	a,f	71.3	J	a,f	117	J	a,f	61.4	J	a,f	72.9	J	a,f	198	J	a,f
Percent Solids	93.6			89.8			90.6			86.3			89.2			88.7			83.7			93.2		

Val-Validity Refer to Data Qualifiers in Table 1B.
Com.-Comments Refer to the Corresponding Section in the Narrative for each letter.
IDL-Instrument Detection Limit for Waters, MDL-Method Detection Limit for Soils

D1, D2, etc.-Field Duplicate Pairs
FB-Field Blank, EB-Equipment Blank, TB-Travel Blank; BG-Background
CRQL-Contract Required Quantitation Limit

ANALYTICAL RESULTS
TABLE 1A

Case No.: LV924 Memos #2 and #2A
Site: Phelps Dodge
Lab.: Region IX, Las Vegas
Reviewer: Santiago Lee, ESAT/ICF Kaiser Engineers, Inc.
Date: December 27, 1989

Analysis Type: Soil Samples for RAS Metals

Concentration in mg/Kg

Sample Location	PDS-017			PDS-018			PDS-019			PDS-020			PDS-021			PDS-022			Method Blank			Method Blank		
Sample I.D.	LV924-47			LV924-48			LV924-49			LV924-50			LV924-51			LV924-52			Lab Blank 1			Lab Blank 2		
Parameter	Result	Val	Com.	Result	Val	Com.	Result	Val	Com.	Result	Val	Com.	Result	Val	Com.	Result	Val	Com.	Result	Val	Com.	Result	Val	Com.
Aluminium	19500	J	b	14500	J	b	9970	J	b	4740	J	b	9800	J	b	5720	J	b	18.3 L	J	c	13.7 L	J	
Antimony	6.5 U	J	a	6.5 U	J	a	7.1 U	J	a	6.5 U	J	a	10.6 U	J	a	6.1 U	J	a	6.0 U			6.0 U		
Arsenic	6.0	J	a	10.8	J	a	22.7	J	a	16.4	J	a	43.3	J	a	12.0	J	a	0.40 U			0.40 U		
Barium	176	J	b	111	J	b	315	J	b	111	J	b	278	J	b	98.5	J	b	1.0 U			1.0 U		
Beryllium	2.9			1.7			0.83 L	J	c	0.93 L	J	c	0.78 L	J	c	0.65 L	J	c	0.20 U			0.20 U		
Cadmium	1.5	J	a	4.1	J	a	4.8	J	a	3.3	J	a	19.5	J	a	1.5	J	a	1.0 U			1.0 U		
Calcium	5410	J	f	65800	J	f	55700	J	f	3060	J	f	55300	J	f	1010 L	J	c,f	85.9 L	J	c	40.0 U		
Chromium	23.7			23.9			19.2			8.5	J	d	21.6			12.9			1.5 L	J	c	2.4		
Cobalt	18.4			13.6			7.7 L	J	c	17.2			21.0			7.6 L	J	c	2.0 U			2.0 U		
Copper	78.3			631			624			767			7170			512			3.8 L	J	c	1.0 U		
Iron	33200			31400			22100			20700			33900			17700			10 U			12.8 L	J	c
Lead	134	J	f	264	J	f	828	J	f	187	J	f	1240	J	f	188	J	f	10 U			10 U		
Magnesium	24500	J	b,e	16500	J	b,e	11100	J	b,e	2910	J	b,e	9220	J	b,e	2650	J	b,e	40.0 U			40.0 U		
Manganese	2640	J	b	1830	J	b	5160	J	b	1640	J	b	4900	J	b	1150	J	b	7.1			2.1 L	J	c
Mercury	0.22 U		g	0.22 U		g	0.39			0.22 U		g	0.67			0.20 U		g	0.15 U			0.15 U		
Nickel	32.3			18.9			35.0			14.0			33.9			13.2			6.0 U			6.0 U		
Potassium	2230			1320			2340			1520			1620 L	J	c	1480			20.0 U			20.0 U		
Selenium	0.43 U	J	a	0.63 L	J	a,c	0.69 L	J	a,c	0.97 L	J	a,c	4.6	J	a	0.41 U	J	a	0.40 U			0.40 U		
Silver	1.1 U			3.2			2.6			1.1 U			5.3			1.0 U			1.6 L	J	c	1.0 U		
Sodium	311 L	J	c	426 L	J	c	390 L	J	c	317 L	J	c	734 L	J	c	307 L	J	c	20.0 U			20.0 U		
Thallium	0.43 U			0.44 U			0.48 U			0.43 U			0.85 L	J	c	0.41 U			0.40 U			0.40 U		
Vanadium	23.0			18.9			27.6			5.7 L	J	c	25.7			16.4			1.0 U			1.0 U		
Zinc	594	J	a,f	344	J	a,f	670	J	a,f	208	J	a,f	1270	J	a,f	182	J	a,f	1.3 L	J	c	1.2 L	J	c
Percent Solids	93.0			91.8			84.0			92.7			56.5			98.6			---			---		

Val-Validity Refer to Data Qualifiers in Table 1B.
Com.-Comments Refer to the Corresponding Section in the Narrative for each letter.
IDL-Instrument Detection Limit for Waters, MDL-Method Detection Limit for Soils

D1, D2; etc.-Field Duplicate Pairs
FB-Field Blank, EB-Equipment Blank, TB-Travel Blank; BG-Background
CRQL-Contract Required Quantitation Limit

ANALYTICAL RESULTS
TABLE 1A.

Case No.: LV924 Memos #2 and #2A
Site: Phelps Dodge
Lab.: Region IX, Las Vegas
Reviewer: Santiago Lee, ESAT/ICF Kaiser Engineers, Inc.
Date: December 27, 1989

Analysis Type: Soil Samples for RAS Metals

Concentration in mg/Kg

Sample Location																							
Sample I.D.	MDL			CRQL																			
Parameter	Result	Val	Com.	Result	Val	Com.	Result	Val	Com.	Result	Val	Com.	Result	Val	Com.	Result	Val	Com.	Result	Val	Com.	Result	Val	n.
Aluminium	1.0			40.0																			
Antimony	6.0			12.0																			
Arsenic	0.40			2.0																			
Barium	1.0			40.0																			
Beryllium	0.20			1.0																			
Cadmium	1.0			1.0																			
Calcium	40.0			1000																			
Chromium	1.0			2.0																			
Cobalt	2.0			10.0																			
Copper	1.0			5.0																			
Iron	10			20.0																			
Lead	10			1.0																			
Magnesium	40.0			1000																			
Manganese	1.0			3.0																			
Mercury	0.10			0.10																			
Nickel	6.0			8.0																			
Potassium	20.0			1000																			
Selenium	0.40			1.0																			
Silver	1.0			2.0																			
Sodium	20.0			1000																			
Thallium	0.40			2.0																			
Vanadium	1.0			10.0																			
Zinc	1.0			4.0																			
Percent Solids	---			---																			

Val-Validity Refer to Data Qualifiers in Table 1B.
Com.-Comments Refer to the Corresponding Section in the Narrative for each letter.
IDL-Instrument Detection Limit for Waters, MDL-Method Detection Limit for Soils

D1, D2, etc.-Field Duplicate Pairs
FB-Field Blank, EB-Equipment Blank, TB-Travel Blank; BG-Background
CRQL-Contract Required Quantitation Limit

DPO: [ ] ACTION [X] FYI Region IX

INORGANIC REGIONAL DATA ASSESSMENT

CASE NO. LV924 Memos #2 and #2A LABORATORY Region IX, Las Vegas

SDG NO. LV924-305B DATA USER _____

SOW _____ REVIEW COMPLETION DATE December 28, 1989

NO. OF SAMPLES _____ WATER 22 SOIL _____ OTHER

REVIEWER [ ] ESD [X] ESAT [ ] OTHER, CONTRACT/CONTRACTOR _____

	ICP	AA	Hg	Cyanide
1. HOLDING TIMES	O	O	X	
2. INITIAL CALIBRATIONS	O	O	O	
3. CONTINUING CALIBRATIONS	O	O	O	
4. FIELD BLANKS ("F" = not applicable)	F	F	F	
5. LABORATORY BLANKS	X	O	X	
6. ICS	O			
7. LCS	O	O		
8. DUPLICATE ANALYSIS	X	O	O	
9. MATRIX SPIKE	X	X	O	
10. MSA		O		
11. SERIAL DILUTION	X			
12. SAMPLE VERIFICATION	O	O	O	
13. REGIONAL QC ("F" = not applicable)	F	F	F	
14. OVERALL ASSESSMENT	M	X	O	

O = No problems or minor problems that do not affect data usability.
X = No more than about 5% of the data points are qualified as either estimated or unusable.
M = More than about 5% of the data points are qualified as estimated.
Z = More than about 5% of the data points are qualified as unusable.

DPO ACTION ITEMS: _____

AREAS OF CONCERN: Some of the ICP matrix spike, duplicate analysis, LCS, and serial dilution results were outside the acceptable criteria.

U.S. EPA - CLP

2A
INITIAL AND CONTINUING CALIBRATION VERIFICATION

Lab Name: LESC_____ Contract: 68-03-3249

Lab Code: LESC__ Case No.: LV924 SAS No.: _____ SDG No.:LV924-305B

Initial Calibration Source: UNLV,NBS,INT

Continuing Calibration Source: INTERNAL____

Concentration Units: ug/L

Analyte	Initial Calibration True	Initial Calibration Found	Initial Calibration %R(1)	Continuing Calibration True	Continuing Calibration Found	Continuing Calibration %R(1)	Continuing Calibration Found	Continuing Calibration %R(1)	M
Aluminum									NR
Antimony				5000.0	4952.15	99.0			P
Arsenic				50.0	46.60	93.2	48.60	97.2	F
Barium									NR
Beryllium									NR
Cadmium				5000.0	4996.57	100.0			P
Calcium									NR
Chromium									NR
Cobalt									NR
Copper									NR
Iron									NR
Lead									NR
Magnesium									NR
Manganese									NR
Mercury									NR
Nickel									NR
Potassium									NR
Selenium				50.0	53.20	106.4			F
Silver									NR
Sodium									NR
Thallium				25.0	23.30	93.2			F
Vanadium									NR
Zinc				5000.0	5023.32	100.4			P
Cyanide									NR

(1) Control Limits: Mercury 80-120; Other Metals 90-110; Cyanide 85-115

U.S. EPA - CLP

2A
INITIAL AND CONTINUING CALIBRATION VERIFICATION

Lab Name: LESC_____ Contract: 68-03-3249

Lab Code: LESC__ Case No.: LV924 SAS No.: _____ SDG No.:LV924-305B

Initial Calibration Source: UNLV,NBS,INT

Continuing Calibration Source: INTERNAL____

Concentration Units: ug/L

Analyte	Initial Calibration True	Found	%R(1)	Continuing Calibration True	Found	%R(1)	Found	%R(1)	M
Aluminum									NR
Antimony									NR
Arsenic	100.0	101.90	101.9	50.0	51.80	103.6	53.60	107.2	F
Barium									NR
Beryllium									NR
Cadmium									NR
Calcium									NR
Chromium									NR
Cobalt									NR
Copper									NR
Iron									NR
Lead									NR
Magnesium									NR
Manganese									NR
Mercury									NR
Nickel									NR
Potassium									NR
Selenium	100.0	103.70	103.7	50.0	53.70	107.4	48.90	97.8	F
Silver									NR
Sodium									NR
Thallium									NR
Vanadium									NR
Zinc									NR
Cyanide									NR

(1) Control Limits: Mercury 80-120; Other Metals 90-110; Cyanide 85-115

U.S. EPA - CLP

2A
INITIAL AND CONTINUING CALIBRATION VERIFICATION

Lab Name: LESC_____ Contract: 68-03-3249

Lab Code: LESC__ Case No.: LV924 SAS No.: _____ SDG No.:LV924-305B

Initial Calibration Source: UNLV,NBS,INT

Continuing Calibration Source: INTERNAL____

Concentration Units: ug/L

Analyte	Initial Calibration True	Found	%R(1)	Continuing Calibration True	Found	%R(1)	Found	%R(1)	M
Aluminum									NR
Antimony									NR
Arsenic				50.0	52.90	105.8			F
Barium									NR
Beryllium									NR
Cadmium									NR
Calcium									NR
Chromium									NR
Cobalt									NR
Copper									NR
Iron									NR
Lead									NR
Magnesium									NR
Manganese									NR
Mercury									NR
Nickel									NR
Potassium									NR
Selenium				50.0	52.70	105.4			F
Silver									NR
Sodium									NR
Thallium									NR
Vanadium									NR
Zinc									NR
Cyanide									NR

(1) Control Limits: Mercury 80-120; Other Metals 90-110; Cyanide 85-115

U.S. EPA - CLP

2A
INITIAL AND CONTINUING CALIBRATION VERIFICATION

Lab Name: LESC Contract: 68-03-3249

Lab Code: LESC Case No.: LV924 SAS No.: SDG No.: LV924-305B

Initial Calibration Source: UNLV,NBS,INT

Continuing Calibration Source: INTERNAL

Concentration Units: ug/L

Analyte	Initial Calibration True	Found	%R(1)	Continuing Calibration True	Found	%R(1)	Found	%R(1)	M
Aluminum									P
Antimony									P
Arsenic	100.0	100.30	100.3	50.0	49.40	98.8	50.10	100.2	F
Barium									P
Beryllium									P
Cadmium									P
Calcium									P
Chromium									P
Cobalt									P
Copper									P
Iron									P
Lead									P
Magnesium									P
Manganese									P
Mercury									AV
Nickel									P
Potassium									P
Selenium	100.0	101.30	101.3	50.0	49.20	98.4	49.40	98.8	F
Silver									P
Sodium									P
Thallium									F
Vanadium									P
Zinc									P
Cyanide									NR

(1) Control Limits: Mercury 80-120; Other Metals 90-110; Cyanide 85-115

U.S. EPA - CLP

2A
INITIAL AND CONTINUING CALIBRATION VERIFICATION

Lab Name: LESC_____ Contract: 68-03-3249

Lab Code: LESC__ Case No.: LV924 SAS No.: _____ SDG No.:LV924-305B

Initial Calibration Source: UNLV,NBS,INT

Continuing Calibration Source: INTERNAL____

Concentration Units: ug/L

Analyte	Initial Calibration True	Found	%R(1)	Continuing Calibration True	Found	%R(1)	Found	%R(1)	M
Aluminum									P
Antimony									P
Arsenic				50.0	50.60	101.2	54.90	109.8	F
Barium									P
Beryllium									P
Cadmium									P
Calcium									P
Chromium									P
Cobalt									P
Copper									P
Iron									P
Lead									P
Magnesium									P
Manganese									P
Mercury									P
Nickel									P
Potassium									P
Selenium									P
Silver									P
Sodium									P
Thallium									P
Vanadium									P
Zinc									NR
Cyanide									NR

(1) Control Limits: Mercury 80-120; Other Metals 90-110; Cyanide 85-115

U.S. EPA - CLP

2A
INITIAL AND CONTINUING CALIBRATION VERIFICATION

Lab Name: LESC_____ Contract: 68-03-3249

Lab Code: LESC__ Case No.: LV924 SAS No.: _____ SDG No.:LV924-305B

Initial Calibration Source: UNLV,NBS,INT

Continuing Calibration Source: INTERNAL____

Concentration Units: ug/L

Analyte	Initial Calibration True	Found	%R(1)	Continuing Calibration True	Found	%R(1)	Found	%R(1)	M
Aluminum									P
Antimony									F
Arsenic	100.0	110.30	110.3	50.0	51.90	103.8	51.20	102.4	F
Barium									P
Beryllium									P
Cadmium									P
Calcium									P
Chromium									P
Cobalt									P
Copper									P
Iron									P
Lead									P
Magnesium									P
Manganese									NR
Mercury									P
Nickel									P
Potassium									F
Selenium									P
Silver									P
Sodium									F
Thallium									P
Vanadium									P
Zinc									NR
Cyanide									NR
Arsenic 8	100.0	100.60	100.6	50.0	48.40	96.8	50.50	101.0	F
Arsenic 9	100.0	104.30	104.3	50.0	50.20	100.4	50.60	101.2	F

(1) Control Limits: Mercury 80-120; Other Metals 90-110; Cyanide 85-115

U.S. EPA - CLP

2B
CRDL STANDARD FOR AA AND ICP

Lab Name: LESC_____ Contract: 68-03-3249

Lab Code: LESC__ Case No.: LV924 SAS No.: _____ SDG No.:LV924-305B

AA CRDL Standard Source: INTERNAL____

ICP CRDL Standard Source: INTERNAL____

Concentration Units: ug/L

Analyte	CRDL Standard for AA			CRDL Standard for ICP				
	True	Found	%R	True	Initial Found	%R	Final Found	%R
Aluminum				400.0	439.40	109.8	434.80	108.7
Antimony				120.0	120.90	100.8	135.80	113.2
Arsenic	10.0	10.20	102.0					
Barium				200.0	202.80	101.4	202.00	101.0
Beryllium				10.0	10.20	102.0	10.10	101.0
Cadmium				10.0	11.70	117.0	10.60	106.0
Calcium				10000.0	10141.40	101.4	10013.30	100.1
Chromium				20.0	21.00	105.0	23.70	118.5
Cobalt				100.0	109.50	109.5	113.50	113.5
Copper				50.0	51.60	103.2	51.30	102.6
Iron				200.0	127.20	63.6	253.20	126.6
Lead				100.0	134.80	134.8	94.50	94.5
Magnesium				10000.0	10700.50	107.0	10682.40	106.8
Manganese				30.0	34.10	113.7	34.70	115.7
Mercury								
Nickel				80.0	60.30	75.4	70.90	88.6
Potassium				10000.0	9977.10	99.8	9809.90	98.1
Selenium	5.0	4.60	92.0					
Silver				20.0	21.90	109.5	22.20	111.0
Sodium				10000.0	9950.00	99.5	9749.50	97.5
Thallium	10.0	9.40	94.0					
Vanadium				100.0	102.40	102.4	103.70	103.7
Zinc				40.0	42.90	107.2	43.60	109.0

U.S. EPA - CLP

2B
CRDL STANDARD FOR AA AND ICP

Lab Name: LESC_____ Contract: 68-03-3249

Lab Code: LESC__ Case No.: LV924 SAS No.: _____ SDG No.:LV924-305B

AA CRDL Standard Source: INTERNAL____

ICP CRDL Standard Source: INTERNAL____

Concentration Units: ug/L

Analyte	CRDL Standard for AA True	Found	%R	CRDL Standard for ICP Initial True	Found	%R	Final Found	%R
Aluminum								
Antimony				120.0	121.89	101.6	134.11	111.8
Arsenic	10.0	8.50	85.0					
Barium								
Beryllium								
Cadmium				10.0	7.04	70.4	6.38	63.8
Calcium								
Chromium								
Cobalt								
Copper								
Iron								
Lead								
Magnesium								
Manganese								
Mercury								
Nickel								
Potassium								
Selenium	5.0	5.90	118.0					
Silver								
Sodium								
Thallium	10.0	8.90	89.0					
Vanadium								
Zinc				40.0	43.54	108.9	43.25	108.1

U.S. EPA - CLP

2B
CRDL STANDARD FOR AA AND ICP

Lab Name: LESC_____ Contract: 68-03-3249

Lab Code: LESC__ Case No.: LV924 SAS No.: _____ SDG No.:LV924-305B

AA CRDL Standard Source: INTERNAL____

ICP CRDL Standard Source: INTERNAL____

Concentration Units: ug/L

Analyte	CRDL Standard for AA			CRDL Standard for ICP				
	True	Found	%R	True	Initial Found	%R	Final Found	%R
Aluminum								
Antimony								
Arsenic	10.0	9.20	92.0					
Barium								
Beryllium								
Cadmium								
Calcium								
Chromium								
Cobalt								
Copper								
Iron								
Lead								
Magnesium								
Manganese								
Mercury								
Nickel								
Potassium								
Selenium	5.0	3.80	76.0					
Silver								
Sodium								
Thallium	10.0	10.60	106.0					
Vanadium								
Zinc								

U.S. EPA - CLP

2B
CRDL STANDARD FOR AA AND ICP

Lab Name: LESC_____ Contract: 68-03-3249

Lab Code: LESC__ Case No.: LV924 SAS No.: _____ SDG No.:LV924-305B

AA CRDL Standard Source: INTERNAL____

ICP CRDL Standard Source: _____

Concentration Units: ug/L

Analyte	CRDL Standard for AA			CRDL Standard for ICP				
	True	Found	%R	Initial True	Initial Found	Initial %R	Final Found	Final %R
Aluminum								
Antimony								
Arsenic	10.0	10.50	105.0					
Barium								
Beryllium								
Cadmium								
Calcium								
Chromium								
Cobalt								
Copper								
Iron								
Lead								
Magnesium								
Manganese								
Mercury								
Nickel								
Potassium								
Selenium	5.0	5.80	116.0					
Silver								
Sodium								
Thallium								
Vanadium								
Zinc								

U.S. EPA - CLP

2B
CRDL STANDARD FOR AA AND ICP

Lab Name: LESC_____ Contract: 68-03-3249

Lab Code: LESC__ Case No.: LV924 SAS No.: _____ SDG No.:LV924-305B

AA CRDL Standard Source: INTERNAL____

ICP CRDL Standard Source: _____

Concentration Units: ug/L

Analyte	CRDL Standard for AA			CRDL Standard for ICP				
	True	Found	%R	True	Initial Found	%R	Final Found	%R
Aluminum								
Antimony								
Arsenic	10.0	9.60	96.0					
Barium								
Beryllium								
Cadmium								
Calcium								
Chromium								
Cobalt								
Copper								
Iron								
Lead								
Magnesium								
Manganese								
Mercury								
Nickel								
Potassium								
Selenium	5.0	3.90	78.0					
Silver								
Sodium								
Thallium								
Vanadium								
Zinc								

ORIGINAL

U.S. EPA - CLP

2B
CRDL STANDARD FOR AA AND ICP

Lab Name: LESC_____ Contract: 68-03-3249

Lab Code: LESC__ Case No.: LV924 SAS No.: _____ SDG No.:LV924-305B

AA CRDL Standard Source: INTERNAL____

ICP CRDL Standard Source: _____

Concentration Units: ug/L

Analyte	CRDL Standard for AA			CRDL Standard for ICP				
				Initial			Final	
	True	Found	%R	True	Found	%R	Found	%R
Aluminum								
Antimony								
Arsenic	10.0	10.60	106.0					
Barium								
Beryllium								
Cadmium								
Calcium								
Chromium								
Cobalt								
Copper								
Iron								
Lead								
Magnesium								
Manganese								
Mercury								
Nickel								
Potassium								
Selenium								
Silver								
Sodium								
Thallium								
Vanadium								
Zinc								
Arsenic 8	10.0	12.40	124.0					
Arsenic 9	10.0	8.90	89.0					

U.S. EPA - CLP

3
BLANKS

Lab Name: LESC_____ Contract: 68-03-3249

Lab Code: LESC__ Case No.: LV924 SAS No.: _____ SDG No.:LV924-305B

Preparation Blank Matrix (soil/water): SOIL_

Preparation Blank Concentration Units (ug/L or mg/kg): MG/KG

Analyte	Initial Calib. Blank (ug/L)	C	Continuing Calibration Blank (ug/L) 1	C	2	C	3	C	Prepa-ration Blank	C	M
Aluminum	5.2	B	57.4	B	5.0	U	12.4	B	18.320	B	P
Antimony	30.0	U	30.0	U	30.0	U	30.0	U	6.000	U	P
Arsenic	2.0	U	2.0	U	2.0	U	2.0	U	0.400	U	F
Barium	5.0	U	5.0	U	5.0	U	5.0	U	1.000	U	P
Beryllium	1.0	U	1.0	U	1.0	U	1.0	U	0.200	U	P
Cadmium	5.0	U	5.0	U	5.0	U	5.0	U	1.000	U	P
Calcium	200.0	U	200.0	U	200.0	U	200.0	U	85.860	B	P
Chromium	5.0	U	5.0	U	5.0	U	5.0	U	1.460	B	P
Cobalt	10.0	U	10.0	U	10.0	U	10.0	U	2.000	U	P
Copper	5.0	U	5.0	U	5.0	U	5.1	B	3.840	B	P
Iron	-82.4	B	50.0	U	-61.8	B	50.0	U	10.000	U	P
Lead	50.0	U	50.0	U	50.0	U	50.0	U	10.000	U	P
Magnesium	200.0	U	200.0	U	200.0	U	200.0	U	40.000	U	P
Manganese	5.0	U	5.0	U	5.0	U	5.8	B	7.080		P
Mercury	0.2	U	0.2	U	0.2	U	0.2	U	0.150	U	AV
Nickel	30.0	U	30.0	U	30.0	U	30.0	U	6.000	U	P
Potassium	100.0	U	100.0	U	100.0	U	100.0	U	20.000	U	P
Selenium	2.0	U	2.0	U	2.0	U	2.0	U	0.400	U	F
Silver	5.0	U	5.0	U	5.0	U	5.3	B	1.560	B	P
Sodium	100.0	U	100.0	U	100.0	U	100.0	U	20.000	U	P
Thallium	2.0	U	2.0	U	2.0	U	2.0	U	0.400	U	F
Vanadium	5.0	U	5.0	U	5.0	U	5.0	U	1.000	U	P
Zinc	5.0	U	5.0	U	5.0	U	5.0	U	1.340	B	P
Cyanide											NR

U.S. EPA - CLP

3
BLANKS

Lab Name: LESC_____ Contract: 68-03-3249

Lab Code: LESC__ Case No.: LV924 SAS No.: _____ SDG No.:LV924-305B

Preparation Blank Matrix (soil/water): SOIL_

Preparation Blank Concentration Units (ug/L or mg/kg): MG/KG

Analyte	Initial Calib. Blank (ug/L)	C	Continuing Calibration Blank (ug/L) 1	C	2	C	3	C	Prepa-ration Blank	C	M
Aluminum			8.2	B	5.0	U	89.6	B	13.740	B	P
Antimony			30.0	U	30.0	U	30.0	U	6.000	U	P
Arsenic	2.0	U	2.0	U	2.0	U			0.400	U	F
Barium			5.0	U	5.0	U	5.0	U	1.000	U	P
Beryllium			1.0	U	1.0	U	1.0	U	0.200	U	P
Cadmium			5.0	U	5.0	U	5.0	U	1.000	U	P
Calcium			200.0	U	200.0	U	200.0	U	40.000	U	P
Chromium			5.0	U	5.0	U	5.0	U	2.380		P
Cobalt			10.0	U	10.0	U	10.0	U	2.000	U	P
Copper			5.0	U	5.0	U	5.0	U	1.000	U	P
Iron			50.0	U	50.0	U	50.0	U	12.840	B	P
Lead			50.0	U	50.0	U	50.0	U	10.000	U	P
Magnesium			200.0	U	200.0	U	200.0	U	40.000	U	P
Manganese			5.0	U	5.0	U	5.0	U	2.060	B	P
Mercury									0.150	U	AV
Nickel			30.0	U	30.0	U	30.0	U	-7.620	B	P
Potassium			100.0	U	100.0	U	100.0	U	20.000	U	P
Selenium	2.0	U	2.0	U	2.0	U	2.0	U	0.400	U	F
Silver			5.0	U	5.0	U	5.0	U	1.000	U	P
Sodium			100.0	U	100.0	U	100.0	U	20.000	U	P
Thallium	2.0	U	2.0	U	2.0	U	2.0	U	0.400	U	F
Vanadium			5.0	U	5.0	U	5.0	U	1.000	U	P
Zinc			5.0	U	5.0	U	5.0	U	1.160	B	P
Cyanide											NR

U.S. EPA - CLP

3
BLANKS

Lab Name: LESC_____ Contract: 68-03-3249

Lab Code: LESC__ Case No.: LV924 SAS No.: _____ SDG No.:LV924-305B

Preparation Blank Matrix (soil/water): _____

Preparation Blank Concentration Units (ug/L or mg/kg): _____

Analyte	Initial Calib. Blank (ug/L)	C	Continuing Calibration Blank (ug/L) 1	C	2	C	3	C	Prepa-ration Blank	C	M
Aluminum											NR
Antimony	30.0	U	30.0	U	30.0	U	30.0	U			P
Arsenic	2.0	U	2.0	U	2.0	U	2.0	U			F
Barium											NR
Beryllium											NR
Cadmium	5.0	U	5.0	U	5.0	U	5.0	U			P
Calcium											NR
Chromium											NR
Cobalt											NR
Copper											NR
Iron											NR
Lead											NR
Magnesium											NR
Manganese											NR
Mercury											NR
Nickel											NR
Potassium											NR
Selenium	2.0	U	2.0	U	2.0	U					F
Silver											NR
Sodium											NR
Thallium	2.0	U	2.0	U	2.0	U					F
Vanadium											NR
Zinc	5.0	U	5.0	U	5.0	U	5.0	U			P
Cyanide											NR

U.S. EPA - CLP

3
BLANKS

Lab Name: LESC_____ Contract: 68-03-3249

Lab Code: LESC__ Case No.: LV924 SAS No.: _____ SDG No.:LV924-305B

Preparation Blank Matrix (soil/water): _____

Preparation Blank Concentration Units (ug/L or mg/kg): _____

Analyte	Initial Calib. Blank (ug/L)	C	Continuing Calibration Blank (ug/L) 1	C	2	C	3	C	Prepa-ration Blank	C	M
Aluminum											NR
Antimony			30.0	U	30.0	U					P
Arsenic			2.0	U	2.0	U					F
Barium											NR
Beryllium											NR
Cadmium			5.0	U	5.0	U					P
Calcium											NR
Chromium											NR
Cobalt											NR
Copper											NR
Iron											NR
Lead											NR
Magnesium											NR
Manganese											NR
Mercury											NR
Nickel											NR
Potassium											NR
Selenium			2.0	U	2.0	U					F
Silver											NR
Sodium											NR
Thallium											NR
Vanadium											NR
Zinc			5.0	U	5.0	U					P
Cyanide											NR

U.S. EPA - CLP

3
BLANKS

Lab Name: LESC_____ Contract: 68-03-3249

Lab Code: LESC__ Case No.: LV924 SAS No.: _____ SDG No.:LV924-305B

Preparation Blank Matrix (soil/water): _____

Preparation Blank Concentration Units (ug/L or mg/kg): _____

Analyte	Initial Calib. Blank (ug/L)	C	Continuing Calibration Blank (ug/L) 1	C	2	C	3	C	Prepa-ration Blank	C	M
Aluminum											NR
Antimony											NR
Arsenic	2.0	U	2.0	U	2.0	U					F
Barium											NR
Beryllium											NR
Cadmium											NR
Calcium											NR
Chromium											NR
Cobalt											NR
Copper											NR
Iron											NR
Lead											NR
Magnesium											NR
Manganese											NR
Mercury											NR
Nickel											NR
Potassium											NR
Selenium	2.0	U	2.0	U							NR
Silver											NR
Sodium											NR
Thallium											NR
Vanadium											NR
Zinc											NR
Cyanide											NR

U.S. EPA - CLP

3
BLANKS

Lab Name: LESC_____ Contract: 68-03-3249

Lab Code: LESC__ Case No.: LV924 SAS No.: _____ SDG No.:LV924-305B

Preparation Blank Matrix (soil/water): _____

Preparation Blank Concentration Units (ug/L or mg/kg): _____

Analyte	Initial Calib. Blank (ug/L)	C	Continuing Calibration Blank (ug/L) 1	C	2	C	3	C	Prepa-ration Blank	C	M
Aluminum											NR
Antimony											NR
Arsenic	2.0	U	2.0	U	2.0	U	2.0	U			F
Barium											NR
Beryllium											NR
Cadmium											NR
Calcium											NR
Chromium											NR
Cobalt											NR
Copper											NR
Iron											NR
Lead											NR
Magnesium											NR
Manganese											NR
Mercury											NR
Nickel											NR
Potassium											NR
Selenium											NR
Silver											NR
Sodium											NR
Thallium											NR
Vanadium											NR
Zinc											NR
Cyanide											NR
Arsenic 8	2.0	U	2.0	U							F
Arsenic 8	2.0	U	2.0	U							F

U.S. EPA - CLP

4

ICP INTERFERENCE CHECK SAMPLE

Lab Name: LESC_____ Contract: 68-03-3249

Lab Code: LESC__ Case No.: LV924 SAS No: _____ SDG No.:LV924-305B

ICP ID Number: ARL3560_____ ICS Source: UNLV1287____

Concentration Units: ug/L

Analyte	True Sol. A	True Sol. AB	Initial Found Sol. A	Initial Found Sol. AB	Initial Found %R	Final Found Sol. A	Final Found Sol. AB	Final Found %R
Aluminum	511000	508000	480680	482042.8	94.9	475861	477782.2	94.1
Antimony	0	0	40	38.7		-1	32.5	
Arsenic								
Barium	0	483	1	481.7	99.7	1	479.6	99.3
Beryllium	0	474	0	426.9	90.1	0	426.3	89.9
Cadmium	0	909	8	947.7	104.3	8	953.6	104.9
Calcium	476000	470000	427513	429236.4	91.3	425691	425643.9	90.6
Chromium	0	513	12	500.8	97.6	8	495.0	96.5
Cobalt	0	478	7	488.8	102.3	3	482.0	100.8
Copper	0	534	9	548.8	102.8	8	540.8	101.3
Iron	219000	211000	236830	237563.9	112.6	233967	235269.6	111.5
Lead	0	4850	91	4722.3	97.4	26	4673.4	96.4
Magnesium	513000	513000	521222	522591.8	101.9	519592	521149.4	101.6
Manganese	0	470	8	508.7	108.2	4	497.6	105.9
Mercury								
Nickel	0	916	7	898.4	98.1	-10	895.7	97.8
Potassium	0	0	267	279.6		278	270.6	
Selenium								
Silver	0	934	1	980.5	105.0	1	974.9	104.4
Sodium	0	0	127	172.4		148	126.2	
Thallium								
Vanadium	0	475	-24	473.3	99.6	-26	469.5	98.8
Zinc	0	973	-1	930.7	95.7	-2	922.0	94.8

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4

ICP INTERFERENCE CHECK SAMPLE

Lab Name: LESC_____ Contract: 68-03-3249

Lab Code: LESC__ Case No.: LV924 SAS No: _____ SDG No.:LV924-305B

ICP ID Number: ARL3560_____ ICS Source: UNLV1287____

Concentration Units: ug/L

Analyte	True Sol. A	True Sol. AB	Initial Found Sol. A	Initial Found Sol. AB	Initial Found %R	Final Found Sol. A	Final Found Sol. AB	Final Found %R
Aluminum	511000	508000	484512	483936.0	95.3	479893	480034.8	94.5
Antimony	0	0	33	32.0		21	36.7	
Arsenic								
Barium								
Beryllium								
Cadmium	0	909	4	969.0	106.6	5	938.4	103.2
Calcium	476000	470000	426874	424217.8	90.3	425172	425094.6	90.4
Chromium								
Cobalt								
Copper								
Iron	219000	211000	237857	237337.1	112.5	234564	233661.1	110.7
Lead								
Magnesium	513000	513000	522920	521770.6	101.7	517670	517313.4	100.8
Manganese								
Mercury								
Nickel								
Potassium								
Selenium								
Silver								
Sodium								
Thallium								
Vanadium								
Zinc	0	973	0	948.8	97.5	-3	919.0	94.5

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5A
SPIKE SAMPLE RECOVERY

EPA SAMPLE NO.
LV924-305S

Lab Name: LESC Contract: 68-03-3249

Lab Code: LESC Case No.: LV924 SAS No.: SDG No.: LV924-305B

Matrix (soil/water): SOIL Level (low/med): LOW

Concentration Units (ug/L or mg/kg dry weight): MG/KG

Analyte	Control Limit %R	Spiked Sample Result (SSR)	C	Sample Result (SR)	C	Spike Added (SA)	%R	Q	M
Aluminum									NR
Antimony	75-125	57.9540		7.6726	U	127.9	45.3	N	P
Arsenic		77.3402		57.4680		10.2	194.3		F
Barium	75-125	545.8312		85.1662		511.5	90.1		P
Beryllium	75-125	11.9693		1.0486	B	12.8	85.4		P
Cadmium	75-125	26.3683		17.1355		12.8	72.2	N	P
Calcium									NR
Chromium	75-125	510.8696		22.1995		511.5	95.5		P
Cobalt	75-125	147.6982		30.5371		127.9	91.6		P
Copper		8438.4910		9882.5320		63.9	-2258.4		P
Iron									NR
Lead		821.5601		856.3427		127.9	-27.2		P
Magnesium									NR
Manganese		2849.8721		3162.1995		127.9	-244.2		P
Mercury	75-125	1.5825		0.4124		1.0	121.9		AV
Nickel	75-125	151.1253		35.9591		127.9	90.1		P
Potassium									NR
Selenium	75-125	8.0563		3.9099		2.3	180.2	N	F
Silver	75-125	121.7136		6.4962		127.9	90.1		P
Sodium									NR
Thallium	75-125	13.0946		0.6905	B	12.8	97.0		F
Vanadium	75-125	132.0460		18.8235		127.9	88.5		P
Zinc		926.0870		978.3632		127.9	-40.9		P
Cyanide									NR

Comments:

U.S. EPA - CLP

5A
SPIKE SAMPLE RECOVERY

EPA SAMPLE NO.

LV924-46S

Lab Name: LESC Contract: 68-03-3249

Lab Code: LESC Case No.: LV924 SAS No.: SDG No.:LV924-305B

Matrix (soil/water): SOIL Level (low/med): LOW

Concentration Units (ug/L or mg/kg dry weight): MG/KG

Analyte	Control Limit %R	Spiked Sample Result (SSR)	C	Sample Result (SR)	C	Spike Added (SA)	%R	Q	M
Aluminum									NR
Antimony	75-125	70.7725		6.4378	U	107.3	66.0	N	P
Arsenic	75-125	19.0987		12.9614		8.6	71.5	N	F
Barium	75-125	523.5622		153.0043		429.2	86.3		P
Beryllium	75-125	10.6652		1.0086	B	10.7	90.0		P
Cadmium	75-125	14.5494		4.9785		10.7	89.2		P
Calcium									NR
Chromium	75-125	440.9227		14.8927		429.2	99.3		P
Cobalt	75-125	116.8670		14.3348		107.3	95.6		P
Copper		368.4120		369.9785		53.6	-2.9		P
Iron									NR
Lead	75-125	379.2489		262.5966		107.3	108.7		P
Magnesium									NR
Manganese		2715.9657		3114.4635		107.3	-371.4		P
Mercury	75-125	1.00		0.14	U	0.8	125.0		AV
Nickel	75-125	121.5880		20.5150		107.3	94.2		P
Potassium									NR
Selenium	75-125	2.5322		0.5579	B	1.9	103.4		F
Silver	75-125	99.5494		2.1459		107.3	90.8		P
Sodium									NR
Thallium	75-125	11.8455		0.4292	U	10.7	110.4		F
Vanadium	75-125	115.0429		13.7983		107.3	94.4		P
Zinc	75-125	268.0472		197.7682		107.3	65.5	N	P
Cyanide									NR

Comments:

U.S. EPA - CLP

5B
POST SPIKE SAMPLE RECOVERY

EPA SAMPLE NO.
LV924-305

Lab Name: LESC Contract: 68-03-3249

Lab Code: LESC Case No.: LV924 SAS No.: _____ SDG No.: LV924-305B

Matrix (soil/water): SOIL Level (low/med): LOW

Concentration Units (ug/L or mg/kg dry weight): UG/L

Analyte	Control Limit %R	Spiked Sample Result (SSR)	C	Sample Result (SR)	C	Spike Added (SA)	%R	Q	M
Aluminum									NR
Antimony		524.9600		30.0000	U	500.0	105.0		P
Arsenic									F
Barium									P
Beryllium									P
Cadmium		112.9450		63.5186		50.0	98.9		P
Calcium									NR
Chromium									P
Cobalt									P
Copper									P
Iron									NR
Lead									P
Magnesium									NR
Manganese									P
Mercury									AV
Nickel									P
Potassium									NR
Selenium									F
Silver									P
Sodium									NR
Thallium									F
Vanadium									P
Zinc									P
Cyanide									NR

Comments:

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5B
POST SPIKE SAMPLE RECOVERY

EPA SAMPLE NO.
LV924-46

Lab Name: LESC Contract: 68-03-3249

Lab Code: LESC Case No.: LV924 SAS No.: _____ SDG No.: LV924-305B

Matrix (soil/water): SOIL Level (low/med): LOW

Concentration Units (ug/L or mg/kg dry weight): UG/L

Analyte	Control Limit %R	Spiked Sample Result (SSR)	C	Sample Result (SR)	C	Spike Added (SA)	%R	Q	M
Aluminum									NR
Antimony		500.8450		30.0000	U	500.0	101.7		P
Arsenic									F
Barium									P
Beryllium									P
Cadmium									P
Calcium									NR
Chromium									P
Cobalt									P
Copper									P
Iron									NR
Lead									P
Magnesium									NR
Manganese									P
Mercury									AV
Nickel									P
Potassium									NR
Selenium									F
Silver									P
Sodium									NR
Thallium									F
Vanadium									P
Zinc		1369.7370		908.5387		500.0	92.2		P
Cyanide									NR

Comments:

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6
DUPLICATES

EPA SAMPLE NO.

LV924-305D

Lab Name: LESC Contract: 68-03-3249

Lab Code: LESC Case No.: LV924 SAS No.: SDG No.:LV924-305B

Matrix (soil/water): SOIL Level (low/med): LOW

% Solids for Sample: 78.2 % Solids for Duplicate: 78.2

Concentration Units (ug/L or mg/kg dry weight): MG/KG

Analyte	Control Limit	Sample (S)	C	Duplicate (D)	C	RPD	Q	M
Aluminum		11108.6189		10772.3274		3.1		P
Antimony	15.3	7.6726	U	7.6726	U			P
Arsenic		57.4680		61.9437		7.5		F
Barium	51.2	85.1662		79.8465		6.4		P
Beryllium	1.3	1.0486	B	0.8951	B	15.8		P
Cadmium		17.1355		15.8312		7.9		P
Calcium		159355.8312		167210.6394		4.8		P
Chromium		22.1995		26.2660		16.8		P
Cobalt	12.8	30.5371		25.3708		18.5		P
Copper		9882.5320		8243.0179		18.1		P
Iron		35764.8849		27945.0128		24.5	*	P
Lead		856.3427		673.9130		23.8	*	P
Magnesium		8876.9054		9150.1023		3.0		P
Manganese		3162.1995		2734.0409		14.5		P
Mercury	0.2	0.4124		0.3453		17.7		AV
Nickel	10.2	35.9591		34.2455		4.9		P
Potassium	1278.8	1136.6752	B	933.1969	B	19.7		P
Selenium	1.3	3.9099		5.4626		33.1	*	F
Silver	2.6	6.4962		4.8849		28.3		P
Sodium	1278.8	455.1407	B	427.3913	B	6.3		P
Thallium	2.6	0.6905	B	0.6650	B	3.8		F
Vanadium	12.8	18.8235		17.6726		6.3		P
Zinc		978.3632		878.1841		10.8		P
Cyanide								NR

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6
DUPLICATES

EPA SAMPLE NO.

LV924-46D

Lab Name: LESC Contract: 68-03-3249

Lab Code: LESC Case No.: LV924 SAS No.: SDG No.:LV924-305B

Matrix (soil/water): SOIL Level (low/med): LOW

% Solids for Sample: 93.2 % Solids for Duplicate: 93.2

Concentration Units (ug/L or mg/kg dry weight): MG/KG

Analyte	Control Limit	Sample (S)	C	Duplicate (D)	C	RPD	Q	M
Aluminum		7777.6609		4981.6738		43.8	*	P
Antimony	12.9	6.4378	U	6.4378	U			P
Arsenic		12.9614		12.2747		5.4		F
Barium	42.9	153.0043		105.1502		37.1	*	P
Beryllium	1.1	1.0086	B	0.8155	B	21.2		P
Cadmium	1.1	4.9785		3.6052		32.0	*	P
Calcium	1073.0	1931.2876		1519.2060		23.9		P
Chromium		14.8927		12.6824		16.0		P
Cobalt	10.7	14.3348		10.2146	B	33.6		P
Copper		369.9785		281.1803		27.3	*	P
Iron		19302.5751		14198.0043		30.5	*	P
Lead		262.5966		257.8755		1.8		P
Magnesium	1073.0	3492.9399		2373.9485		38.1	*	P
Manganese		3114.4635		2122.3605		37.9	*	P
Mercury	0.1	0.1463	U	0.1341	U			AV
Nickel	8.6	20.5150		14.7210		32.9		P
Potassium	1073.0	2291.9742		1689.5064		30.3		P
Selenium	1.1	0.5579	B	0.4721	B	16.7		F
Silver	2.1	2.1459		1.5665	B	31.2		P
Sodium	1073.0	355.0215	B	387.0386	B	8.6		P
Thallium	2.1	0.4292	U	0.4292	U			F
Vanadium	10.7	13.7983		10.4506	B	27.6		P
Zinc		197.7682		138.8412		35.0	*	P
Cyanide								NR

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LABORATORY CONTROL SAMPLE

Lab Name: LESC_____ Contract: 68-03-3249

Lab Code: LESC__ Case No.: LV924 SAS No.: _____ SDG No.:LV924-305B

Solid LCS Source: QB2S86_____

Aqueous LCS Source: _____

Analyte	Aqueous (ug/L) True	Found	%R	Solid (mg/kg) True	Found	C	Limits		%R
Aluminum				15802.0	13892.8		9711.0	21894.0	87.9
Antimony									
Arsenic				17.0	15.3		8.0	26.0	90.0
Barium				260.5	242.7		205.0	316.0	93.2
Beryllium									
Cadmium				11.5	10.3		8.0	15.0	89.6
Calcium				2826.0	2406.7		1900.0	3756.0	85.2
Chromium				41.0	43.0		28.0	54.0	104.9
Cobalt				78.5	71.6		54.0	103.0	91.2
Copper				25.5	25.8		14.0	37.0	101.2
Iron				20850.0	21956.2		15764.0	25937.0	105.3
Lead				33.0	33.1		11.0	55.0	100.3
Magnesium				4908.0	6187.3		3817.0	6000.0	126.1
Manganese				367.5	367.8		311.0	424.0	100.1
Mercury				18.0	17.0		5.0	31.0	94.4
Nickel				31.0	26.3		22.0	40.0	84.8
Potassium				2985.0	2587.7		1900.0	4070.0	86.7
Selenium				24.5	23.8		17.0	32.0	97.1
Silver				25.5	26.9		21.0	30.0	105.5
Sodium									
Thallium									
Vanadium				65.5	60.2		49.0	82.0	91.9
Zinc				54.0	47.5		40.0	68.0	88.0
Cyanide									

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8
STANDARD ADDITION RESULTS

Lab Name: LESC_____ Contract: 68-03-3249

Lab Code: LESC__ Case No.: LV924 SAS No.: _____ SDG No.:LV924-305B

Concentration Units: ug/L

EPA Sample No.	An	Dil.	0 ADD Abs	1 ADD CON	1 ADD ABS	2 ADD CON	2 ADD ABS	3 ADD CON	3 ADD ABS	Final Conc.	r	Q
24-405B	AS	1	45.600	18	60.800	36	85.400	54	108.000	36.7	0.9955	
24-415B	AS	1	26.900	18	51.100	36	68.600	54	92.500	23.2	0.9981	
24-425B	AS	1	23.800	18	43.700	36	66.900	54	96.400	16.1	0.9960	
24-445B	AS	1	13.200	18	29.000	36	53.000	54	82.700	7.4	0.9911	+
24-445B	AS	1	13.200	18	34.600	36	52.000	54	70.900	13.5	0.9992	
24-451B	AS	1	26.000	18	48.300	36	68.200	54	91.500	24.1	0.9996	
24-305B	SE	1	10.600	18	26.600	36	40.000	54	54.400	13.9	0.9994	
24-305D	SE	1	14.700	18	29.200	36	43.800	54	56.400	19.4	0.9994	
24-315B	SE	1	7.700	18	25.800	36	41.300	54	60.100	8.2	0.9994	
24-355B	SE	1	17.300	18	33.200	36	47.800	54	62.900	20.9	0.9999	
24-385B	SE	1	7.200	18	23.000	36	39.500	54	55.200	8.0	1.0000	
24-51	SE	1	9.600	18	27.400	36	43.500	54	57.600	11.8	0.9987	
24-305S	SE	1	20.500	10	26.900	20	33.300	30	40.000	31.5	0.9999	

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ICP SERIAL DILUTION

EPA SAMPLE NO.

LV924-305B

Lab Name: LESC Contract: 68-03-3249

Lab Code: LESC Case No.: LV924 SAS No.: SDG No.: LV924-305B

Matrix (soil/water): SOIL Level (low/med): LOW

Concentration Units: ug/L

Analyte	Initial Sample Result (I)	C	Serial Dilution Result (S)	C	% Difference	Q	M
Aluminum	43434.70		46734.00		7.6		P
Antimony	30.00	U	150.00	U			NR
Arsenic							F
Barium	333.00		351.50	B	5.6		P
Beryllium	4.10	B	5.00	U	100.0		P
Cadmium	67.00		78.00		16.4		P
Calcium	623081.30		693164.50		11.2	E	P
Chromium	86.80		90.50		4.3		P
Cobalt	119.40		131.00	B	9.7		P
Copper	38640.70		40485.00		4.8		P
Iron	139840.70		147645.50		5.6		P
Lead	3348.30		3741.00		11.7	E	P
Magnesium	34708.70		36302.00		4.6		P
Manganese	12364.20		13498.50		9.2		P
Mercury							AV
Nickel	140.60		150.00	U	100.0		P
Potassium	4444.40	B	4508.00	B	1.4		P
Selenium							F
Silver	25.40		25.50	B	0.4		P
Sodium	1779.60	B	1758.00	B	1.2		P
Thallium							F
Vanadium	73.60		77.50	B	5.3		P
Zinc	3825.40		4215.00		10.2	E	P

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9

ICP SERIAL DILUTION

EPA SAMPLE NO.

LV924-46

Lab Name: LESC Contract: 68-03-3249

Lab Code: LESC Case No.: LV924 SAS No.: SDG No.:LV924-305B

Matrix (soil/water): SOIL Level (low/med): LOW

Concentration Units: ug/L

Analyte	Initial Sample Result (I)	C	Serial Dilution Result (S)	C	% Difference	Q	M
Aluminum	36243.90		38173.00		5.3		P
Antimony	30.00	U	150.00	U			NR
Arsenic							F
Barium	713.00		754.00	B	5.8		P
Beryllium	4.70	B	5.00	U	100.0		P
Cadmium	23.20		25.00	U	100.0		P
Calcium	8999.80		9337.00	B	3.7		P
Chromium	69.40		70.00		0.9		P
Cobalt	66.80		89.50	B	34.0		P
Copper	1724.10		1810.50		5.0		P
Iron	89950.00		94655.00		5.2		P
Lead	1223.70		1295.00		5.8		P
Magnesium	16277.10		16898.50	B	3.8		P
Manganese	14513.40		15299.50		5.4		P
Mercury							AV
Nickel	95.60		150.00	U	100.0		P
Potassium	10680.60		10838.00	B	1.5		P
Selenium							F
Silver	10.00		25.00	U	100.0		P
Sodium	1654.40	B	1691.50	B	2.2		P
Thallium							F
Vanadium	64.30		69.50	B	8.1		P
Zinc	921.60		1009.00		9.5		P

(RRIOCS)

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HOLDING TIMES

Lab Name: LESC_____ Contract: 68-03-3249

Lab Code: LESC__ Case No.: LV924 SAS No.: _____ SDG No.:LV924-305B

EPA Sample No.	Matrix	Date Received	Mercury Prep Date	Mercury Holding Time	Cyanide Prep Date	Cyanide Holding Time
LV924-305B	SOIL	10/12/89	11/24/89	43		
LV924-305D	SOIL	10/12/89	11/24/89	43		
LV924-305S	SOIL	10/12/89	11/24/89	43		
LV924-315B	SOIL	10/12/89	11/24/89	43		
LV924-335B	SOIL	10/12/89	11/24/89	43		
LV924-345B	SOIL	10/12/89	11/24/89	43		
LV924-355B	SOIL	10/12/89	11/24/89	43		
LV924-365B	SOIL	10/12/89	11/24/89	43		
LV924-375B	SOIL	10/12/89	11/24/89	43		
LV924-385B	SOIL	10/12/89	11/24/89	43		
LV924-395B	SOIL	10/12/89	11/24/89	43		
LV924-405B	SOIL	10/12/89	11/24/89	43		

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HOLDING TIMES

Lab Name: LESC_____ Contract: 68-03-3249

Lab Code: LESC__ Case No.: LV924 SAS No.: _____ SDG No.:LV924-305B

EPA Sample No.	Matrix	Date Received	Mercury Prep Date	Mercury Holding Time	Cyanide Prep Date	Cyanide Holding Time
LV924-415B	SOIL	10/12/89	11/24/89	43		
LV924-425B	SOIL	10/12/89	11/24/89	43		
LV924-435B	SOIL	10/12/89	11/24/89	43		
LV924-445B	SOIL	10/12/89	11/24/89	43		
LV924-455B	SOIL	10/12/89	11/24/89	43		
LV924-46	SOIL	10/12/89	11/24/89	43		
LV924-46D	SOIL	10/12/89	11/24/89	43		
LV924-46S	SOIL	10/12/89	11/24/89	43		
LV924-47	SOIL	10/12/89	11/24/89	43		
LV924-48	SOIL	10/12/89	11/24/89	43		
LV924-49	SOIL	10/12/89	11/24/89	43		
LV924-50	SOIL	10/12/89	11/24/89	43		
LV924-51	SOIL	10/12/89	11/24/89	43		
LV924-52	SOIL	10/12/89	11/24/89	43		

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INSTRUMENT DETECTION LIMITS (QUARTERLY)

Lab Name: LESC_____ Contract: 68-03-3249

Lab Code: LESC__ Case No.: LV924 SAS No.: _____ SDG No.:LV924-305B

ICP ID Number: _____ Date: 11/30/89

Flame AA ID Number : FIAAV_____

Furnace AA ID Number : PE5000_____

Analyte	Wave-length (nm)	Back-ground	CRDL (ug/L)	IDL (ug/L)	M
Aluminum			200		NR
Antimony			60		NR
Arsenic	193.78	BZ	10	2.0	F
Barium			200		NR
Beryllium			5		NR
Cadmium			5		NR
Calcium			5000		NR
Chromium			10		NR
Cobalt			50		NR
Copper			25		NR
Iron			100		NR
Lead			5		NR
Magnesium			5000		NR
Manganese			15		NR
Mercury	253.78		0.2	0.2	AV
Nickel			40		NR
Potassium			5000		NR
Selenium	196.08	BZ	5	2.0	F
Silver			10		NR
Sodium			5000		NR
Thallium	276.88	BZ	10	2.0	F
Vanadium			50		NR
Zinc			20		NR

Comments:

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INSTRUMENT DETECTION LIMITS (QUARTERLY)

Lab Name: LESC_____ Contract: 68-03-3249

Lab Code: LESC__ Case No.: LV924 SAS No.: _____ SDG No.:LV924-305B

ICP ID Number: ARL3560_____ Date: 11/30/89

Flame AA ID Number : _____

Furnace AA ID Number : _____

Analyte	Wave-length (nm)	Back-ground	CRDL (ug/L)	IDL (ug/L)	M
Aluminum	396.15		200	5.0	P
Antimony	217.59		60	30.0	P
Arsenic			10		NR
Barium	455.40		200	5.0	P
Beryllium	313.11		5	1.0	P
Cadmium	226.50		5	5.0	P
Calcium	422.67		5000	200.0	P
Chromium	267.72		10	5.0	P
Cobalt	228.62		50	10.0	P
Copper	324.75		25	5.0	P
Iron	247.29		100	50.0	P
Lead	220.35		5	50.0	P
Magnesium	279.55		5000	200.0	P
Manganese	257.61		15	5.0	P
Mercury			0.2		NR
Nickel	231.60		40	30.0	P
Potassium	766.49		5000	100.0	P
Selenium			5		NR
Silver	328.07		10	5.0	P
Sodium	589.59		5000	100.0	P
Thallium			10		NR
Vanadium	292.40		50	5.0	P
Zinc	213.86		20	5.0	P

Comments:

U.S. EPA - CLP

12A
ICP INTERELEMENT CORRECTION FACTORS (QUARTERLY)

Lab Name: LESC_____ Contract: 68-03-3249

Lab Code: LESC__ Case No.: LV924 SAS No.: _____ SDG No.:LV924-305B

ICP ID Number: ARL3560_____ Date: 11/30/89

Analyte	Wavelength (nm)	Interelement Correction Factors for : Al	Ca	Fe	Mg	__
Aluminum	396.15					
Antimony	217.59					
Arsenic						
Barium	455.40					
Beryllium	313.11					
Cadmium	226.50			0.0003600		
Calcium	422.67					
Chromium	267.72					
Cobalt	228.62					
Copper	324.75					
Iron	247.29					
Lead	220.35					
Magnesium	279.55					
Manganese	257.61			0.0000676		
Mercury						
Nickel	231.60					
Potassium	766.49					
Selenium						
Silver	328.07					
Sodium	589.59					
Thallium						
Vanadium	292.40			0.0000978		
Zinc	213.86					

Comments:

_____

_____

_____

_____

U.S. EPA - CLP

13
ICP LINEAR RANGES (QUARTERLY)

Lab Name: LESC_____ Contract: 68-03-3249

Lab Code: LESC__ Case No.: LV924 SAS No.: _____ SDG No.:LV924-305B

ICP ID Number: ARL3560_____ Date: 11/30/89

Analyte	Integ. Time (Sec.)	Concentration (ug/L)	M
Aluminum	10.00	100.0	
Antimony	10.00	100.0	
Arsenic			NR
Barium	10.00	100.0	
Beryllium	10.00	100.0	
Cadmium	10.00	100.0	
Calcium	10.00	100.0	
Chromium	10.00	100.0	
Cobalt	10.00	100.0	
Copper	10.00	100.0	
Iron	10.00	100.0	
Lead	10.00	100.0	
Magnesium	10.00	100.0	
Manganese	10.00	100.0	
Mercury			NR
Nickel	10.00	100.0	
Potassium	10.00	100.0	
Selenium			NR
Silver	10.00	100.0	
Sodium	10.00	100.0	
Thallium			NR
Vanadium	10.00	100.0	
Zinc	10.00	100.0	

Comments:

Toluene-d8	1.350	1.436	-6.4
BFB	0.580	0.559	3.6
1,2-Dichloroethane-d4	1.263	1.180	6.6

Toluene-d8	1.350	1.4[illegible]	-5.9
BFB	0.580	0.539	7.1
1,2-Dichloroethane-d4	1.263	1.127	10.8

Appendix E

Data Validation Report For Groundwater Sampling By ADEQ

File

ICF KAISER ENGINEERS

ICF KAISER ENGINEERS, INC
160 SPEAR STREET, SUITE 1380
SAN FRANCISCO CA 94105-1535
415/957-0110

NOV 0 9 1989

MEMORANDUM

SUBJECT: Review of Analytical Data

FROM: Santiago Lee
ESAT Senior Organic Data Reviewer
ICF Kaiser Engineers, Inc.

THROUGH: David Bingham
Environmental Scientist
Quality Assurance Management Section
Environmental Services Branch, OPM (P-3-2)

TO: Anita Parker
Site Assessment Manager
Site Evaluation Section (H-8-1)

Attached are comments resulting from Region 9 review of the following analytical data:

SITE: Phelps Dodge
EPA SITE ID NO:
CASE/SAS NO.: LV924 Memo #1A

LABORATORY: Region IX, Las Vegas
ANALYSIS: Volatiles by GC/MS

SAMPLE NO.: LV924-01 through LV924-10

COLLECTION DATE: October 5, 6, and 10, 1989

REVIEWER: Wendy Walfoort, ICF Kaiser Engineers, Inc.
TELEPHONE NUMBER: (415) 957-0110

If there are any questions, please contact the reviewer.

Attachment

Data Validation Report

Case No.:	LV924 Memo #1A	
Site:	Phelps Dodge	
Laboratory:	Region IX, Las Vegas	
Reviewer:	Wendy Walfoort	
	ESAT/ICF Kaiser Engineers, Inc.	SAS: VOA by GC/MS
Date:	November 3, 1989	Ten (10) air samples

I. Introduction

Region IX Laboratory in Las Vegas received ten (10) water samples on October 6, 1989 and October 12, 1989 for SAS volatiles (VOA) analysis by gas chromatography/mass spectrometry (GC/MS).

The sample numbers are LV924-01 through LV924-10. Samples LV924-06 and LV924-10 are field blanks; sample LV924-03 is a background sample. Sample number LV924-08 is an apparatus blank. Samples LV924-01 and LV924-09 are a field duplicate pair. The samples were collected on October 5 through 10, 1989 and were analyzed on October 9 through 13, 1989.

The analytical results with qualifications are presented in Table 1A. Tentatively identified compounds (TICs) are listed in Table 1C. The sample quantitation limits are presented in Table 2.

This document was prepared according to EPA document "Laboratory Data Validation Functional Guidelines for Evaluating Organic Analyses", April 11, 1985.

II. Validity and Comments

A. The reported results in Table 1A for the following analytes are considered as estimates (J) and usable for limited purposes only:

- Methylene chloride in sample LV924-06
- Chloroform in samples LV924-06, LV924-08, and LV924-10

Concentrations for these compounds are above the instrument detection limits but below the laboratory quantitation limits. The values are considered to be qualitatively acceptable but quantitatively unreliable due to the uncertainty in analytical precision near the limit of detection.

B. Due to blank contamination problems, results reported in Table 1A for the following analyte are considered as estimates (J) and usable for limited purposes only:

- Methylene chloride in samples LV924-02, LV924-03, LV924-04, and LV924-05

Methylene chloride was found in all three field blanks at concentrations between 0.4 ug/L and 0.6 ug/L. Methylene chloride is a common laboratory contaminant. Even though it was not found in the method blank, the presence of methylene chloride in the samples and field blanks is suspected to be due to laboratory contamination.

The results in the samples listed above were considered as non-detected and estimated (UJ) and the quantitation limits have been increased where appropriate, according to the blank qualification rules.

C. Chloroform was found in all three field blanks, but not in any samples, at levels below the sample quantitation limit.

D. The 40 CFR 136 holding times were not exceeded for any of the water samples.

E. All other quality control criteria specified in the SAS request were met and considered acceptable. All other results are considered valid and usable for all purposes.

ANALYTICAL RESULTS
TABLE 1A*

Case No.: LV924 Memo #1A
Site: Phelps Dodge
Lab.: Region IX, Las Vegas
Reviewer: Wendy Walfoort, ESAT/ICF Kaiser Engineers, Inc.
Date: November 3, 1989

Analysis Type: Water Samples for SAS
Volatile Analyses

Concentration in ug/L

Sample Location																							
Sample I.D.	LV924-01 D1			LV924-02			LV924-03 BG			LV924-04			LV924-05			LV924-06 FB			LV924-07		
Compound	Result	Val	Com.	Result	Val	Com.	Result	Val	Com.	Result	Val	Com.	Result	Val	Com.	Result	Val	Com.	Result	Val	Com.
VOLATILES																					
Methylene Chloride	1 U			1 U	J	b	1 U	J	b	1 U	J	b	1 U	J	b	0.6	J	a	1 U		
Chloroform	1 U			1 U			1 U			1 U			1 U			0.5	J	a	1 U		

*The other requested analytes were analyzed for, but "Not Detected". The Sample Quantitation Limits are listed in Table 2.

Val-Validity Refer to Data Qualifiers in Table 1B.
Com.-Comments Refer to the Corresponding Section in the Narrative for each letter.
CRQL-Contract Required Quantitation Limits
NA-Not Analyzed

D1, D2, etc.-Field Duplicate Pairs
FB-Field Blank, EB Equipment Blank, TB-Travel Blank
BG-Background Sample

ANALYTICAL RESULTS
TABLE 1A*

Case No.: LV924 Memo #1A
Site: Phelps Dodge
Lab.: Region IX, Las Vegas
Reviewer: Wendy Walfoort, ESAT/ICF Kaiser Engineers, Inc.
Date: November 3, 1989

Analysis Type: Water Samples for SAS
Volatile Analyses

Concentration in ug/L

Sample Location / Sample I.D.	LV924-08 AB			LV924-09 D1			LV924-10 FB			Method Blank VBLK1			Method Blank VBLK2			Method Blank VBLK3			CRQL		
Compound	Result	Val	Com.	Result	Val	Com.	Result	Val	Com.	Result	Val	Com.	Result	Val	Com.	Result	Val	Com.	Result	Val	Com.
VOLATILES																					
Methylene Chloride	1 U			1 U			1 U			1 U			1 U			1 U			1		
Chloroform	0.4	J	a	1 U			0.4	J	a	1 U			1 U			1 U			1		

*The other requested analytes were analyzed for, but "Not Detected". The Sample Quantitation Limits are listed in Table 2.

Val-Validity Refer to Data Qualifiers in Table 1B.

Com.-Comments Refer to the Corresponding Section in the Narrative for each letter.

CRQL-Contract Required Quantitation Limits

NA-Not Analyzed

D1, D2, etc.-Field Duplicate Pairs

FB-Field Blank, EB-Equipment Blank, TB-Travel Blank

BG-Background Sample

TABLE
Detected Tentatively Identified Compounds (TICs)

CASE No. : LV924 Memo #1A
SITE : Phelps Dodge
LAB : Region IX, Las Vegas
REVIEWER : Wendy Walfoort
ESAT/ICF Kaiser Engineers, Inc.
DATE : November 3, 1989

Sample Number	Compound	Fraction	Retention Time, min.	Concentration (ug/L)	Rating[a] (Remarks)
LV924-01 D1	None Found	VOA			
LV924-02	None Found	VOA			
LV924-03 BG	None Found	VOA			
LV924-04	None Found	VOA			
LV924-05	None Found	VOA			
LV924-06 FB	None Found	VOA			
LV924-07	None Found	VOA			
LV924-08 FB	None Found	VOA			
LV924-09 D1	Unknown	VOA	2.03	1.2 J	
LV924-10 FB	None Found	VOA			

J (estimated): Value is considered usable for limited purposes.
[a] Rating codes--probability that identification is correct:
A = High B = Moderate C = Low

TABLE 5a
Sample Quantitation Limits

Case No. : LV924 Memo #1A
Site : Phelps Dodge
Lab : Region IX, Las Vegas
Reviewer : Wendy Walfoort
ESAT/ICF Kaiser Engineers, Inc.
Date : November 3, 1989

Volatile Compounds	Units, ug/L	Q	C
Chloromethane	2		
Bromomethane	2		
Vinyl Chloride	2		
Chloroethane	2		
Methylene Chloride	1		
Acetone	2		
Carbon Disulfide	1		
1,1-Dichloroethene	1		
1,1-Dichloroethane	1		
1,2-Dichloroethene (total)	1		
Chloroform	1		
1,2-Dichloroethane	1		
1,2-Dibromoethane	1		
2-Butanone	2		
1,1,1-Trichloroethane	1		
Carbon Tetrachloride	1		
Vinyl Acetate	2		
Bromodichloromethane	1		
1,2-Dichloropropane	1		
cis-1,3-Dichloropropene	1		
Trichloroethene	1		
Dibromochloromethane	1		
1,1,2-Trichloroethane	1		
Benzene	1		
trans-1,3-Dichloropropene	1		
Bromoform	1		
4-Methyl-2-pentanone	2		
2-Hexanone	2		
Tetrachloroethene	1		
1,1,2,2-Tetrachloroethane	1		
Toluene	1		
Chlorobenzene	1		
Ethylbenzene	1		
Styrene	1		
Total Xylenes	1		

Q - Qualifier
C - Comment

TABLE 5b
DATA QUALIFIERS

NO QUALIFIERS indicates that the data are acceptable both qualitatively and quantitatively.

U Indicates that the compounds is not detected above the concentration listed.

J Results are estimated and the data are valid for limited purposes. The results are qualitatively acceptable.

N Presumptive evidence of the presence of the material. The compound identification is considered to be tentative. The data are usable for limited purposes.

R Results are rejected and data are invalid for all purposes.

Method Blanks and Associated Samples:

VBlk 1: LV924-01, LV924-02, LV924-03, LV924-05, LV924-06

VBlk 2: LV924-04, LV924-09

VBlk 3: LV924-07, LV924-08, LV924-10

File

ICF KAISER ENGINEERS

ICF KAISER ENGINEERS, INC.
160 SPEAR STREET SUITE 1380
SAN FRANCISCO, CA 94105-1535
415/957-0110

DEC 2 1 1989

MEMORANDUM

SUBJECT: Review of Analytical Data

FROM: Santiago Lee
ESAT Senior Organic Data Reviewer
ICF Kaiser Engineers, Inc.

THROUGH: David Bingham
Environmental Scientist
Quality Assurance Management Section
Environmental Services Branch, OPM (P-3-2)

TO: Tom Mix
Project Officer
Site Evaluation Section (H-8-1)

Attached are comments resulting from Region 9 review of the following analytical data:

SITE: Phelps Dodge Douglas
EPA SITE ID NO:
CASE/SAS NO.: LV924 Memo #1

LABORATORY: Region IX, Las Vegas
ANALYSIS: RAS Metals

SAMPLE NO.: LV924-15 through LV924-24

COLLECTION DATE: October 5, 6, and 10, 1989

REVIEWER: Margie dela Merced, ICF Kaiser Engineers, Inc.
TELEPHONE NUMBER: (415) 957-0110

If there are any questions, please contact the reviewer.

Attachment

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION IX
215 Fremont Street
San Francisco, Ca. 94105

MEMORANDUM

DATE: 1/11/90

SUBJECT: Request for Unvalidated Data Table 1 and/or Data Validation

FROM: Dave Bingham, QAMS

TO: ICF

[ ] Request for Unvalidated Data Table 1
[X] Request for Data Validation

Please return this form with the completed task.

Site: Phelps Dodge Project: _____ Program: SF

Lab: Reg IX Las Vegas Case #: LV924 SAS #: _____ Memo #: 2

Analyses: We & Hg Matrix: W Number: 1

Date Received: 1/4/90 [ ] Entered

Site ID Number: LV924-18A Call in this to Margie {no number} IS.

Dates Sampled: 10/5/89

Describe the analyses and list the sample numbers for this data package:

RAS-METALS LV924-18A

Blanks:
Bckgrd:
Duplicates: } no QA/QC.

Project Officer: Anita Parker H-8-1
Sampler: Bryant Hall-

Task Completed: / / Transmit Table 1A: / / [ ] Entered

Data Validation Requested: / / Validation Assigned: / / Days Due: Due Date: / /

Reviewer/Staff: _____ [ ] Entered Task Completed: / /

Completed and Sent to RPM: 2/15/90 Late: ____ [ ] Entered

Please indicate if the laboratory did not comply with the contract and/or if the SAS request was not adequate:

Data Validation Report

Case No.: LV924 Memo #1
Site: Phelps Dodge Douglas
Laboratory: Region IX, Las Vegas
Reviewer: Margie dela Merced
ESAT/ICF Kaiser Engineers, Inc. 11 Waters for
Date: December 14, 1989 RAS Metals

I. Introduction

Region IX Laboratory in Las Vegas received eight (8) water samples on October 7, 1989 and three (3) water samples on October 12, 1989 for dissolved metals and mercury analyses. Sample numbers LV924-15 through LV924-18 were collected on October 5, 1989. Sample numbers LV924-19 through LV924-22 were collected on October 6, 1989 and sample numbers LV924-22A through LV924-24 were collected on October 10, 1989.

Sample number LV924-18 is a background sample. Sample numbers LV924-21 and LV924-24 are field blanks and sample numbers LV924-22 and LV924-23 are equipment blanks. Sample numbers LV924-15 and LV924-16 are a field duplicate pair. Field duplicate pairs have D# suffix (D1 for the first field pair, D2 for the second field pair) in Table 1A.

The analytical results with qualifications are listed in Table 1A. This report was prepared in accordance with the EPA Contract Laboratory Program Inorganic Statement of Work for July 1987 and EPA document "Laboratory Data Validation Functional Guidelines For Evaluating Inorganic Analyses" (1985).

II. Validity and Comments

A. The following results are considered usable for limited purposes because of accuracy problems. The results are considered as estimates and are flagged "J" in Table 1A.

- Silver in all of the samples

Matrix spike recovery result for silver did not meet criteria for accuracy as listed below. The possible percent bias is also presented below. Where the sample results for silver are undetected, the matrix spike recovery result shows a severe analytical deficiency and false negatives may exist.

Parameter	LV924-10 Water % Recovery	Water % Bias
Silver	28	-72

The samples analyzed for dissolved metals were not digested. Since the samples were not digested, the spikes were added to the samples after filtration but before analysis.

B. The results reported in Table 1A for the following analytes are considered as estimates (J) and usable for limited purposes only.

- All results above the instrument detection limit but below the contract required quantitation limit (denoted with an "L" qualifier)

The results above the instrument detection limit but below the contract required quantitation limit are considered qualitatively acceptable but quantitatively unreliable due to uncertainties in the analytical precision near the limit of detection.

C. The background sample, LV924-18, had a number of parameters with concentration levels above the field blanks.

D. The 40 CFR 136 holding times were not exceeded for any of the samples.

E. All other results are considered valid and usable for all purposes. All QC parameters, other than those discussed here, have been met and are considered acceptable.

DPO: [ ] ACTION [X] FYI Region IX

INORGANIC REGIONAL DATA ASSESSMENT

CASE NO. LV924 Memo #1 LABORATORY Region IX, Las Vegas

SDG NO. LV924-15 DATA USER _____

SOW 7/87 REVIEW COMPLETION DATE December 14, 1989

NO. OF SAMPLES 11 WATER _____ SOIL _____ OTHER

REVIEWER [ ] ESD [X] ESAT [ ] OTHER, CONTRACT/CONTRACTOR _____

		ICP	AA	Hg	Cyanide
1	HOLDING TIMES	O	O	O	
2	INITIAL CALIBRATIONS	O	O	O	
3	CONTINUING CALIBRATIONS	O	O	O	
4	FIELD BLANKS ("F" = not applicable)	O	O	O	
5	LABORATORY BLANKS	O	O	O	
6.	ICS	O			
7.	LCS	O	O		
8.	DUPLICATE ANALYSIS	O	O	O	O
9.	MATRIX SPIKE	O	O	O	O
10.	MSA		O		
11.	SERIAL DILUTION	O			
12.	SAMPLE VERIFICATION	O	O	O	O
13.	REGIONAL QC ("F" = not applicable)	F	F	F	F
14.	OVERALL ASSESSMENT	O	O	O	O

O = No problems or minor problems that do not affect data usability.
X = No more than about 5% of the data points are qualified as either estimated or unusable.
M = More than about 5% of the data points are qualified as estimated.
Z = More than about 5% of the data points are qualified as unusable.

DPO ACTION ITEMS: _____

AREAS OF CONCERN: _____

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION IX
215 Fremont Street
San Francisco, Ca. 94105

MEMORANDUM

DATE: 12/14/89

SUBJECT: Request for Unvalidated Data Table 1 and/or Data Validation

FROM: Dave Bingham, QAMS

TO: ICF

[ ] Request for Unvalidated Data Table 1
[X] Request for Data Validation

Please return this form with the completed task.

Site: Phelps Dodge Project: Douglas Program: SF

Lab: Reg 9 Case #: LV924 SAS #: _____ Memo #: 3 2A

Analyses: RAS-IN Matrix: S Number: 22

Date Received: 12/14/89 [ ] Entered

Site ID Number:

Dates Sampled: 10/11/89

Describe the analyses and list the sample numbers for this data package:

LV924 - 305B, 355B, 395B, 435B,
47, 51, 315B, 365B, 405B, 445B
335B, 375B, 415B, 455B,
345B, 385B, 425B, 46, 48 → 52

Blanks:
Bckgrd: 435B
Duplicates:

Skw 12/22/89

Project Officer:
Sampler: Dan Williams/AZ DEQ

Task Completed: / / Transmit Table 1A: / / [ ] Entered

Data Validation Requested: / / Validation Assigned: / / Days Due: Due Date: / /

Reviewer/Staff: [ ] Entered Task Completed: / /

Completed and Sent to RPM: 1/5/90 Late: [ ] Entered

Please indicate if the laboratory did not comply with the contract and/or if the SAS request was not adequate:

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION IX
215 Fremont Street
San Francisco, Ca. 94105

MEMORANDUM

DATE: 12,5,89

SUBJECT: Request for Unvalidated Data Table 1 and/or Data Validation

FROM: Dave Bingham, QAMS

TO: ICF

[X] Request for Unvalidated Data Table 1
[ ] Request for Data Validation

Please return this form with the completed task.

Site: Phelps Dodge Project: ~~Hub~~ Daylar Program: ____

Lab: Region IX Lab, LV Case #: LV924 SAS #: N/A Memo #: 02

Analyses: ~~CAS~~ Metals: As, Hg, Se TR Matrix: S Number: 22

SMC 12/7/89

Date Received: 12,5,89 [ ] Entered

Site ID Number:

Dates Sampled: 10/11/89

Describe the analyses and list the sample numbers for this data package:
Soil ~~CAS~~ Metals. LV924-305B, 315B, 335B, 345B, 355B, 365B, 385B, 395B, 405B, 415B, 425B, 435B, 445B, 455B, 46, 47, 48, 49, 50, 51, 52.

Blanks:
Bckgrd: LV924-435B
Duplicates:

Project Officer:
Sampler: DAN WILLIAMS.

Task Completed: / / Transmit Table 1A: / / [ ] Entered

Data Validation Requested: / / Validation Assigned: / / Days Due: Due Date: / /

Reviewer/Staff: [ ] Entered Task Completed: / /

Completed and Sent to RPM: 1,5,90 Late: [ ] Entered

Please indicate if the laboratory did not comply with the contract and/or if the SAS request was not adequate:

U.S. EPA - CLP

2A
INITIAL AND CONTINUING CALIBRATION VERIFICATION

Lab Name: LESC Contract: 68-03-3249

Lab Code: LESC Case No.: LV924 SAS No.: SDG No.: LV924-305B

Initial Calibration Source: UNLV,NBS,INT

Continuing Calibration Source: INTERNAL

Concentration Units: ug/L

Analyte	Initial Calibration True	Found	%R(1)	Continuing Calibration True	Found	%R(1)	Found	%R(1)	M
Aluminum	2000.0	2146.30	107.3	5000.0	5083.90	101.7	4963.10	99.3	P
Antimony	1010.0	1056.40	104.6	5000.0	5034.80	100.7	5106.90	102.1	P
Arsenic	100.0	103.20	103.2	50.0	50.90	101.8	53.60	107.2	F
Barium	2010.0	1951.20	97.1	500.0	502.60	100.5	507.40	101.5	P
Beryllium	501.0	460.40	91.9	500.0	504.90	101.0	511.90	102.4	P
Cadmium	492.0	502.90	102.2	5000.0	5049.10	101.0	5148.30	103.0	P
Calcium	50200.0	49452.40	98.5	25000.0	24552.70	98.2	24371.10	97.5	P
Chromium	503.0	506.80	100.8	5000.0	5058.00	101.2	5162.10	103.2	P
Cobalt	498.0	503.60	101.1	5000.0	5054.00	101.1	5140.90	102.8	P
Copper	520.0	525.20	101.0	5000.0	4967.60	99.4	4973.60	99.5	P
Iron	2081.0	2053.20	98.7	5000.0	5034.40	100.7	5171.30	103.4	P
Lead	4960.0	4744.40	95.7	5000.0	5030.50	100.6	5067.40	101.3	P
Magnesium	25700.0	25716.20	100.1	25000.0	25028.20	100.1	25070.40	100.3	P
Manganese	504.0	534.20	106.0	5000.0	5016.00	100.3	5079.60	101.6	P
Mercury	28.1	27.20	96.8	5.0	5.17	103.4	5.40	108.0	AV
Nickel	485.0	475.60	98.1	5000.0	5042.90	100.9	5119.20	102.4	P
Potassium	50200.0	51752.00	103.1	25000.0	24442.50	97.8	24354.50	97.4	P
Selenium	100.0	103.80	103.8	50.0	50.50	101.0	48.60	97.2	F
Silver	484.0	463.60	95.8	1000.0	1006.60	100.7	1012.20	101.2	P
Sodium	51500.0	51112.70	99.2	25000.0	24346.10	97.4	24230.80	96.9	P
Thallium	50.0	50.40	100.8	25.0	24.20	96.8	25.80	103.2	F
Vanadium	505.0	504.20	99.8	5000.0	5035.20	100.7	5118.80	102.4	P
Zinc	2920.0	2902.60	99.4	5000.0	5089.50	101.8	5189.00	103.8	P
Cyanide									NR

(1) Control Limits: Mercury 80-120; Other Metals 90-110; Cyanide 85-115

U.S. EPA - CLP

2A
INITIAL AND CONTINUING CALIBRATION VERIFICATION

Lab Name: LESC_____ Contract: 68-03-3249

Lab Code: LESC__ Case No.: LV924 SAS No.: _____ SDG No.:LV924-305B

Initial Calibration Source: UNLV,NBS,INT

Continuing Calibration Source: INTERNAL____

Concentration Units: ug/L

Analyte	Initial Calibration True	Found	%R(1)	Continuing Calibration True	Found	%R(1)	Found	%R(1)	M
Aluminum				5000.0	4949.40	99.0	4933.90	98.7	P
Antimony				5000.0	5041.40	100.8	5037.30	100.7	P
Arsenic				50.0	55.00	110.0	54.90	109.8	F
Barium				500.0	505.40	101.1	506.20	101.2	P
Beryllium				500.0	508.80	101.8	510.20	102.0	P
Cadmium				5000.0	5101.00	102.0	5104.00	102.1	P
Calcium				25000.0	24701.50	98.8	24293.10	97.2	P
Chromium				5000.0	5068.60	101.4	5093.90	101.9	P
Cobalt				5000.0	5050.60	101.0	5068.50	101.4	P
Copper				5000.0	4964.60	99.3	4952.80	99.1	P
Iron				5000.0	4937.50	98.8	4803.00	96.1	P
Lead				5000.0	5033.90	100.7	5015.80	100.3	P
Magnesium				25000.0	25010.10	100.0	24943.70	99.8	P
Manganese				5000.0	4958.50	99.2	4976.50	99.5	P
Mercury				5.0	5.32	106.4			AV
Nickel				5000.0	5071.10	101.4	5071.90	101.4	P
Potassium				25000.0	24447.40	97.8	24196.30	96.8	P
Selenium				50.0	48.40	96.8	46.30	92.6	F
Silver				1000.0	998.20	99.8	1002.70	100.3	P
Sodium				25000.0	24402.40	97.6	24146.50	96.6	P
Thallium				25.0	24.80	99.2	27.40	109.6	F
Vanadium				5000.0	5049.90	101.0	5070.20	101.4	P
Zinc				5000.0	5046.30	100.9	5078.40	101.6	P
Cyanide									NR

(1) Control Limits: Mercury 80-120; Other Metals 90-110; Cyanide 85-115

U.S. EPA - CLP

2A
INITIAL AND CONTINUING CALIBRATION VERIFICATION

Lab Name: LESC_____ Contract: 68-03-3249

Lab Code: LESC__ Case No.: LV924 SAS No.: _____ SDG No.:LV924-305B

Initial Calibration Source: UNLV,NBS,INT

Continuing Calibration Source: INTERNAL____

Concentration Units: ug/L

Analyte	Initial Calibration True	Found	%R(1)	Continuing Calibration True	Found	%R(1)	Found	%R(1)	M
Aluminum				5000.0	4909.90	98.2	5103.40	102.1	P
Antimony				5000.0	5057.60	101.2	5039.20	100.8	P
Arsenic	100.0	103.90	103.9	50.0	51.50	103.0	50.70	101.4	F
Barium				500.0	507.80	101.6	502.50	100.5	P
Beryllium				500.0	512.80	102.6	505.30	101.1	P
Cadmium				5000.0	5152.30	103.0	5057.80	101.2	P
Calcium				25000.0	24493.00	98.0	24649.30	98.6	P
Chromium				5000.0	5106.70	102.1	5026.80	100.5	P
Cobalt				5000.0	5096.30	101.9	5026.10	100.5	P
Copper				5000.0	4972.30	99.4	4945.70	98.9	P
Iron				5000.0	4897.50	98.0	5029.50	100.6	P
Lead				5000.0	5027.40	100.5	5012.40	100.2	P
Magnesium				25000.0	25106.60	100.4	25148.90	100.6	P
Manganese				5000.0	4990.80	99.8	4921.80	98.4	P
Mercury									NR
Nickel				5000.0	5128.90	102.6	5056.90	101.1	P
Potassium				25000.0	24358.50	97.4	24518.30	98.1	P
Selenium	100.0	100.80	100.8	50.0	49.70	99.4	49.60	99.2	F
Silver				1000.0	995.70	99.6	999.10	99.9	P
Sodium				25000.0	24219.40	96.9	24323.90	97.3	P
Thallium	50.0	47.80	95.6	25.0	23.40	93.6	23.50	94.0	F
Vanadium				5000.0	5080.00	101.6	5015.50	100.3	P
Zinc				5000.0	5098.80	102.0	5037.70	100.8	P
Cyanide									NR

(1) Control Limits: Mercury 80-120; Other Metals 90-110; Cyanide 85-115

U.S. EPA - CLP

2A
INITIAL AND CONTINUING CALIBRATION VERIFICATION

Lab Name: LESC Contract: 68-03-3249

Lab Code: LESC Case No.: LV924 SAS No.: SDG No.: LV924-305B

Initial Calibration Source: UNLV,NBS,INT

Continuing Calibration Source: INTERNAL

Concentration Units: ug/L

Analyte	Initial Calibration True	Found	%R(1)	Continuing Calibration True	Found	%R(1)	Found	%R(1)	M
Aluminum									NR
Antimony	1010.0	1072.03	106.1	5000.0	5043.00	100.8	5029.83	100.6	P
Arsenic				50.0	55.20	110.4			F
Barium									NR
Beryllium									NR
Cadmium	492.0	508.90	103.4	5000.0	5196.70	103.9	5165.49	103.3	P
Calcium									NR
Chromium									NR
Cobalt									NR
Copper									NR
Iron									NR
Lead									NR
Magnesium									NR
Manganese									NR
Mercury									NR
Nickel									NR
Potassium									NR
Selenium				50.0	46.80	93.6	47.40	94.8	F
Silver									NR
Sodium									NR
Thallium				25.0	25.40	101.6	25.30	101.2	F
Vanadium									NR
Zinc	2920.0	2987.29	102.3	5000.0	5233.26	104.7	5205.40	104.1	P
Cyanide									NR

(1) Control Limits: Mercury 80-120; Other Metals 90-110; Cyanide 85-115

U.S. EPA - CLP

2A
INITIAL AND CONTINUING CALIBRATION VERIFICATION

Lab Name: LESC Contract: 68-03-3249

Lab Code: LESC Case No.: LV924 SAS No.: _____ SDG No.: LV924-305B

Initial Calibration Source: UNLV,NBS,INT

Continuing Calibration Source: INTERNAL

Concentration Units: ug/L

Analyte	Initial Calibration True	Initial Calibration Found	Initial Calibration %R(1)	Continuing Calibration True	Continuing Calibration Found	Continuing Calibration %R(1)	Continuing Calibration Found	Continuing Calibration %R(1)	M
Aluminum									NR
Antimony				5000.0	5024.05	104.8	4998.54	100.0	P
Arsenic	100.0	95.80	95.8	50.0	45.90	91.8	49.90	99.8	F
Barium									NR
Beryllium									NR
Cadmium				5000.0	5119.38	102.4	5026.86	100.5	P
Calcium									NR
Chromium									NR
Cobalt									NR
Copper									NR
Iron									NR
Lead									NR
Magnesium									NR
Manganese									NR
Mercury									NR
Nickel									NR
Potassium									NR
Selenium	100.0	103.40	103.4	50.0	53.20	106.4	53.70	107.4	F
Silver									NR
Sodium									NR
Thallium	50.0	47.70	95.4	25.0	24.70	98.8	24.60	98.4	F
Vanadium									NR
Zinc				5000.0	5156.48	103.1	5062.43	101.2	P
Cyanide									NR

(1) Control Limits: Mercury 80-120; Other Metals 90-110; Cyanide 85-115

DPO: [ ] ACTION [X] FYI Region IX

ORGANIC REGIONAL DATA ASSESSMENT

CASE NO. LV924 Memo #1A LABORATORY Region IX, Las Vegas

SDG NO. LV924-01 DATA USER _____

SOW _____ REVIEW COMPLETION DATE November 3, 1989

NO. OF SAMPLES 10 WATER _____ SOIL _____ OTHER

REVIEWER [ ] ESD [X] ESAT [ ] OTHER, CONTRACT/CONTRACTOR _____

	VOA	BNA	PEST	OTHER
1. HOLDING TIMES	O			
2. GC-MS TUNE/GC PERFORMANCE	O			
3. INITIAL CALIBRATIONS	O			
4. CONTINUING CALIBRATIONS	O			
5. FIELD BLANKS ("F" = not applicable)	O			
6. LABORATORY BLANKS	O			
7. SURROGATES	O			
8. MATRIX SPIKE/DUPLICATES	O			
9. REGIONAL QC ("F" = not applicable)	F			
10. INTERNAL STANDARDS	O			
11. COMPOUND IDENTIFICATION	O			
12. COMPOUND QUANTITATION	O			
13. SYSTEM PERFORMANCE	O			
14. OVERALL ASSESSMENT	O			

O = No problems or minor problems that do not affect data usability.
X = No more than about 5% of the data points are qualified as either estimated or unusable.
M = More than about 5% of the data points are qualified as estimated.
Z = More than about 5% of the data points are qualified as unusable.

DPO ACTION ITEMS: _____

_____

AREAS OF CONCERN: _____

_____

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION IX
215 Fremont Street
San Francisco, Ca. 94105

MEMORANDUM

DATE: 10/30/89

SUBJECT: Request for Unvalidated Data Table 1 and/or Data Validation

FROM: Dave Bingham, QAMS

TO: ICF

[ ] Request for Unvalidated Data Table 1
[X] Request for Data Validation

Please return this form with the completed task.

Site: Phelps Dodge Project: Douglas Program: SF

Lab: Reg IX LV Case #: LV924 SAS #: _____ Memo #: 01

Analyses: RAS-Or VOAs Matrix: W Number: 4 10

Date Received 10/30/89 [ ] Entered

Site Specific:

Dates Sampled: 10/12/89

Describe the analyses and list the sample numbers for this data package:

06, 21, 22, 08, 23, 10 #24

Blanks:
Background: 03 to 18
Duplicates: 01 #09, 15 #16
Project Officer: Anita Parker ~~Carolyn Douglas~~ (H-8-1)
Sampler: ~~John Chester~~ Dan Williams DEQ-4E

Task Complete: / / Transmit Table 1A: / / [ ] Entered

Data Validation Requested: / / Validation Assigned: / / Days Due: ____ Due Date: / /

Reviewer/Staff: _____ [ ] Entered Task Completed: / /

Completed and Sent to RPM: 11/9/89 Late: ____ [ ] Entered

Please indicate if the laboratory did not comply with the contract and/or if the SAS request was not adequate:

E.L. Wade Inc.

CASE NARRATIVE

Laboratory: Region IX
Case Number: LV924 (Phelps Dodge Superfund Site)
Sample Delivery Group (SDG): LV924-01
Contract: CERCLA
Document Control #: ESAT-A-9B0037
Analyses Performed: GC/MS for Volatile Organics
Sample Numbers:

EPA Number	Sample ID	File ID
LV924-01	90W001	89I0287
LV924-02	90W003	89I0288
LV924-03	90W004	89I0289
LV924-04	90W005	89I0299
LV924-05MS	90W008MS	89I0297
LV924-05MSD	90W009DS	89I0298
LV924-05	90W006	89I0292
LV924-06	90W007	89I0291
LV924-07	90W057	89I0301
LV924-08	90W058	89I0302
LV924-09	90W002	89I0300
LV924-10	89W059	89I0303
VBLK1	90W010RB	B1009
VBLK2	90W010RB	B1010
VBLK3	90W062RB	B1013

Two sets of 10 water samples taken from the Phelps Dodge Superfund Site were received at the Region IX EPA laboratory on 10/6/89 and 10/12/89. Analyses for volatile organics by the low detection limit (25 ml sparge) method were requested.

Methylene chloride was found in low concentrations (< 1.0 PPB) in samples LV924-02 to LV924-06. Chloroform was found in low concentrations (<1.0 PPB) in samples LV924-06, LV924-08, and LV924-10. Sample LV924-10 contained a TIC compound (possibly fluorotrimethyl silane) at approximately 1 PPB. No TCL or TIC compounds were found in any other samples.

All method requirements were met. The data is of good quality.

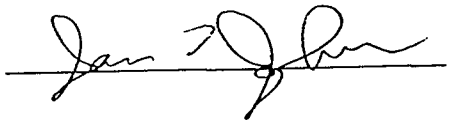
All protocols required of method 624 were followed with two exceptions. The quantitation mass for surrogate BFB was changed from 95 to 176. This was required because 1,1,2,2-tetrachloroethane has a mass 95 fragment ion and coelutes with BFB, therefore contributing to the BFB response factor. The reference compound for bromoform was changed from 1,4-difluorobenzene to d5-chlorobenzene. Bromoform is nearly the last compound to elute from a VOCOL capillary column, so it should be referenced against the last internal standard.

A definition of the codes used on the chromatograms (RIC's) to identify internal standard and surrogate peaks are given on the following page.

I certify that this data package is in compliance with the terms and conditions of the contract, both technically and for completeness, for other than the conditions detailed above.

Release of the data contained in this hardcopy data package and in the computer-readable data submitted on floppy diskette has been authorized by the Laboratory Manager or his designee, as verified by the following signature.

James L. Johnson
Team Leader, Region IX Laboratory



2A
WATER VOLATILE SURROGATE RECOVERY

Lab Name: REGIONIX EPA Contract: SUPERFUND

Lab Code: FINN Case No.: LV924 SAS No.: _____ SDG No.: 924-01

	EPA SAMPLE NO.	S1 (TOL) #	S2 (BFB) #	S3 (DCE) #	OTHER	TOT OUT
01	LV924-01	103	104	99		0
02	LV924-02	101	107	104		0
03	LV924-03	99	111	101		0
04	LV924-04	99	101	101		0
05	LV924-05	99	110	104		0
06	LV924-06	99	107	100		0
07	LV924-07	90	105	101		0
08	LV924-08	90	108	95		0
09	LV924-09	97	104	102		0
10	LV924-10	96	102	94		0
11	LV924-04DS	95	107	97		0
12	LV924-04MS	96	106	96		0
13	VBLK1	103	104	100		0
14	VBLK2	100	103	100		0
15	VBLK3	104	98	97		0

	QC LIMITS
S1 (TOL) = Toluene-d8	(88-110)
S2 (BFB) = Bromofluorobenzene	(86-115)
S3 (DCE) = 1,2-Dichloroethane-d4	(76-114)

Column to be used to flag recovery values

* Values outside of contract required QC limits

D Surrogates diluted out

3A

WATER VOLATILE MATRIX SPIKE/MATRIX SPIKE DUPLICATE RECOVERY

Lab Name: REGION IX EPA Contract: SUPERFUND

Lab Code: FINN Case No.: LV924 SAS No.: _____ SDG No.: 924-01

Matrix Spike - EPA Sample No.: LV924-04

COMPOUND	SPIKE ADDED (ug/L)	SAMPLE CONCENTRATION (ug/L)	MS CONCENTRATION (ug/L)	MS % REC #	QC LIMITS REC.
1,1-Dichloroethene	10.0	0	8.52	85	61-145
Trichloroethene	10.0	0	10.2	102	71-120
Benzene	10.0	0	10.3	103	76-127
Toluene	10.0	0	9.69	97	76-125
Chlorobenzene	10.0	0	10.3	103	75-130

COMPOUND	SPIKE ADDED (ug/L)	MSD CONCENTRATION (ug/L)	MSD % REC #	% RPD #	QC LIMITS RPD	QC LIMITS REC.
1,1-Dichloroethene	10.0	8.10	81	5	14	61-145
Trichloroethene	10.0	10.3	103	-1	14	71-120
Benzene	10.0	10.4	104	-1	11	76-127
Toluene	10.0	9.73	97	0	13	76-125
Chlorobenzene	10.0	10.4	104	-1	13	75-130

Column to be used to flag recovery and RPD values with an asterisk

* Values outside of QC limits

RPD: 0 out of 5 outside limits
Spike Recovery: 0 out of 10 outside limits

COMMENTS: EPA #LV924-04-PHELPS DODGE SF CASE LV924-REG IX #90W005
EM 1125-GC DESC VO-SCAN DESC VO-25 ML PURGE

4A

VOLATILE METHOD BLANK SUMMARY

Lab Name: REGION IX EPA Contract: SUPERFUND

Lab Code: FINN Case No.: LV924 SAS No.: _____ SDG No.: 924-01

Lab File ID: B1009 Lab Sample ID: 90W010RB

Date Analyzed: 10/09/89 Time Analyzed: 1109

Matrix: (soil/water) WATER Level:(low/med) LOW

Instrument ID: FINN

THIS METHOD BLANK APPLIES TO THE FOLLOWING SAMPLES, MS AND MSD:

	EPA SAMPLE NO.	LAB SAMPLE ID	LAB FILE ID	TIME ANALYZED
01	LV924-01	90W001	89I0287	1151
02	LV924-02	90W003	89I0288	1254
03	LV924-03	90W004	89I0289	1330
04	LV924-05	90W006	89I0292	1511
05	LV924-06	90W007	89I0291	1440

COMMENTS: METHOD BLANK-SF CASE LV924-PHELPS DODGE-REG IX #90W010RB
EM 1125-SCAN DESC VO-GC DESC VO-25 ML PURGE

4A

VOLATILE METHOD BLANK SUMMARY

Lab Name: REGION IX EPA Contract: SUPERFUND

Lab Code: FINN Case No.: LV924 SAS No.: _____ SDG No.: 924-01

Lab File ID: B1010 Lab Sample ID: 90W010RB

Date Analyzed: 10/10/89 Time Analyzed: 1414

Matrix: (soil/water) WATER Level:(low/med) LOW

Instrument ID: FINN

THIS METHOD BLANK APPLIES TO THE FOLLOWING SAMPLES, MS AND MSD:

	EPA SAMPLE NO.	LAB SAMPLE ID	LAB FILE ID	TIME ANALYZED
01	LV924-04	90W005	89I0299	1636
02	LV924-09	90W002	89I0300	1707
03	LV924-04DS	90W009DS	89I0298	1557
04	LV924-04MS	90W008MS	89I0297	1521

COMMENTS: METHOD BLANK -PHELPS DODGE SF CASE LV924-REG IX #90W010RB
EM 1125-GC DESC VO-SCAN DESC VO-25 ML PURGE

4A
VOLATILE METHOD BLANK SUMMARY

Lab Name: REGION IX EPA Contract: SUPERFUND

Lab Code: FINN Case No.: LV924 SAS No.: _____ SDG No.: 924-01

Lab File ID: B1013 Lab Sample ID: 90W062RB

Date Analyzed: 10/13/89 Time Analyzed: 1055

Matrix: (soil/water) WATER Level:(low/med) LOW

Instrument ID: FINN

THIS METHOD BLANK APPLIES TO THE FOLLOWING SAMPLES, MS AND MSD:

	EPA SAMPLE NO.	LAB SAMPLE ID	LAB FILE ID	TIME ANALYZED
01	LV924-07	90W057	89I0301	1138
02	LV924-08	90W058	89I0302	1304
03	LV924-10	90W059	89I0303	1338

COMMENTS: METHOD BLANK-PHELPS DODGE SF CASE LV924-REG IX #90W062RB
EM 1125-SCAN DESC VO-GC DESC VO-25 ML PURGE

5A

VOLATILE ORGANIC GC/MS TUNING AND MASS CALIBRATION - BROMOFLUOROBENZENE (BFB)

Lab Name: REGION IX EPA Contract: SUPERFUND

Lab Code: FINN Case No.: LV924 SAS No.: _____ SDG No.: 924-01

Lab File ID: BF1003 BFB Injection Date: 10/03/89

Instrument ID: FINN BFB Injection Time: 0829

Matrix:(soil/water) WATER Level:(low/med) LOW Column:(pack/cap) CAP

m/e	ION ABUNDANCE CRITERIA	% RELATIVE ABUNDANCE
50	15.0 - 40.0% of mass 95	16.7
75	30.0 - 60.0% of mass 95	41.1
95	Base peak, 100% relative abundance	100.0
96	5.0 - 9.0% of mass 95	8.3
173	Less than 2.0% of mass 174	0.1 (0.1)1
174	Greater than 50.0% of mass 95	80.9
175	5.0 - 9.0% of mass 174	6.1 (7.5)1
176	Greater than 95.0%, but less than 101.0% of mass 174	79.5 (98.3)1
177	5.0 - 9.0% of mass 176	5.2 (6.6)2

1-Value is % mass 174 2-Value is % mass 176

THIS TUNE APPLIES TO THE FOLLOWING SAMPLES, MS, MSD, BLANKS, AND STANDARDS:

	EPA SAMPLE NO.	LAB SAMPLE ID	LAB FILE ID	DATE ANALYZED	TIME ANALYZED
01	VSTD040	C1003A	C1003A	10/03/89	0936
02	VSTD030	C1003B	C1003B	10/03/89	1012
03	VSTD020	C1003C	C1003C	10/03/89	1053
04	VSTD010	C1003D	C1003D	10/03/89	1135
05	VSTD004	C1003EE	C1003EE	10/03/89	1608

5A

VOLATILE ORGANIC GC/MS TUNING AND MASS CALIBRATION - BROMOFLUOROBENZENE (BFB)

Lab Name: REGION IX EPA Contract: SUPERFUND

Lab Code: FINN Case No.: LV924 SAS No.: _____ SDG No.: 924-01

Lab File ID: BF1009 BFB Injection Date: 10/09/89

Instrument ID: I-50 BFB Injection Time: 0953

Matrix:(soil/water) WATER Level:(low/med) LOW Column:(pack/cap) CAP

m/e	ION ABUNDANCE CRITERIA	% RELATIVE ABUNDANCE
50	15.0 - 40.0% of mass 95	16.1
75	30.0 - 60.0% of mass 95	39.6
95	Base peak, 100% relative abundance	100.0
96	5.0 - 9.0% of mass 95	8.3
173	Less than 2.0% of mass 174	0.0 (0.0)1
174	Greater than 50.0% of mass 95	74.7
175	5.0 - 9.0% of mass 174	5.3 (7.1)1
176	Greater than 95.0%, but less than 101.0% of mass 174	72.5 (97.1)1
177	5.0 - 9.0% of mass 176	5.1 (7.1)2

1-Value is % mass 174 2-Value is % mass 176

THIS TUNE APPLIES TO THE FOLLOWING SAMPLES, MS, MSD, BLANKS, AND STANDARDS:

	EPA SAMPLE NO.	LAB SAMPLE ID	LAB FILE ID	DATE ANALYZED	TIME ANALYZED
01	VSTD010A	C1009	C1009	10/09/89	1032
02	VBLK1	90W010RB	B1009	10/09/89	1109
03	LV924-01	90W001	89I0287	10/09/89	1151
04	LV924-02	90W003	89I0288	10/09/89	1254
05	LV924-03	90W004	89I0289	10/09/89	1330
06	LV924-06	90W007	89I0291	10/09/89	1440
07	LV924-05	90W006	89I0292	10/09/89	1511

5A

VOLATILE ORGANIC GC/MS TUNING AND MASS CALIBRATION - BROMOFLUOROBENZENE (BFB)

Lab Name: REGION IX EPA Contract: SUPERFUND

Lab Code: FINN Case No.: LV924 SAS No.: _____ SDG No.: 924-01

Lab File ID: BF1010 BFB Injection Date: 10/10/89

Instrument ID: FINN BFB Injection Time: 0906

Matrix:(soil/water) WATER Level:(low/med) LOW Column:(pack/cap) CAP

m/e	ION ABUNDANCE CRITERIA	% RELATIVE ABUNDANCE
50	15.0 - 40.0% of mass 95	16.0
75	30.0 - 60.0% of mass 95	40.1
95	Base peak, 100% relative abundance	100.0
96	5.0 - 9.0% of mass 95	8.1
173	Less than 2.0% of mass 174	0.0 (0.0)1
174	Greater than 50.0% of mass 95	74.7
175	5.0 - 9.0% of mass 174	5.2 (6.9)1
176	Greater than 95.0%, but less than 101.0% of mass 174	72.6 (97.2)1
177	5.0 - 9.0% of mass 176	4.9 (6.8)2

1-Value is % mass 174 2-Value is % mass 176

THIS TUNE APPLIES TO THE FOLLOWING SAMPLES, MS, MSD, BLANKS, AND STANDARDS:

	EPA SAMPLE NO.	LAB SAMPLE ID	LAB FILE ID	DATE ANALYZED	TIME ANALYZED
01	VSTD010B	C1010	C1010	10/10/89	1336
02	VBLK2	90W010RB	B1010	10/10/89	1414
03	LV924-04MS	90W008MS	89I0297	10/10/89	1521
04	LV924-04DS	90W009DS	89I0298	10/10/89	1557
05	LV924-04	90W005	89I0299	10/10/89	1636
06	LV924-09	90W002	89I0300	10/10/89	1707

5A

VOLATILE ORGANIC GC/MS TUNING AND MASS CALIBRATION - BROMOFLUOROBENZENE (BFB)

Lab Name: REGION IX EPA Contract: SUPERFUND

Lab Code: FINN Case No.: LV924 SAS No.: _____ SDG No.: 924-01

Lab File ID: BF1012 BFB Injection Date: 10/12/89

Instrument ID: I-50 BFB Injection Time: 0855

Matrix:(soil/water) WATER Level:(low/med) LOW Column:(pack/cap) CAP

m/e	ION ABUNDANCE CRITERIA	% RELATIVE ABUNDANCE
50	15.0 - 40.0% of mass 95	21.4
75	30.0 - 60.0% of mass 95	48.0
95	Base peak, 100% relative abundance	100.0
96	5.0 - 9.0% of mass 95	8.3
173	Less than 2.0% of mass 174	0.1 (0.1)1
174	Greater than 50.0% of mass 95	89.1
175	5.0 - 9.0% of mass 174	6.8 (7.6)1
176	Greater than 95.0%, but less than 101.0% of mass 174	88.1 (98.9)1
177	5.0 - 9.0% of mass 176	6.2 (7.0)2

1-Value is % mass 174 2-Value is % mass 176

THIS TUNE APPLIES TO THE FOLLOWING SAMPLES, MS, MSD, BLANKS, AND STANDARDS:

	EPA SAMPLE NO.	LAB SAMPLE ID	LAB FILE ID	DATE ANALYZED	TIME ANALYZED
01	VSTD040	C1012A	C1012A	10/12/89	1350
02	VSTD020	C1012C	C1012C	10/12/89	1501
03	VSTD010	C1012D	C1012D	10/12/89	1537
04	VSTD004	C1012E	C1012E	10/12/89	1608
05	VSTD030	C1012BB	C1012BB	10/12/89	1653

5A

VOLATILE ORGANIC GC/MS TUNING AND MASS CALIBRATION - BROMOFLUOROBENZENE (BFB)

Lab Name: REGION IX EPA Contract: SUPERFUND

Lab Code: FINN Case No.: LV924 SAS No.: _____ SDG No.: 924-01

Lab File ID: BF1013 BFB Injection Date: 10/13/89

Instrument ID: I-50 BFB Injection Time: 0915

Matrix:(soil/water) WATER Level:(low/med) LOW Column:(pack/cap) CAP

m/e	ION ABUNDANCE CRITERIA	% RELATIVE ABUNDANCE
50	15.0 - 40.0% of mass 95	20.8
75	30.0 - 60.0% of mass 95	49.1
95	Base peak, 100% relative abundance	100.0
96	5.0 - 9.0% of mass 95	8.3
173	Less than 2.0% of mass 174	0.2 (0.2)1
174	Greater than 50.0% of mass 95	89.2
175	5.0 - 9.0% of mass 174	6.4 (7.2)1
176	Greater than 95.0%, but less than 101.0% of mass 174	88.5 (99.2)1
177	5.0 - 9.0% of mass 176	6.0 (6.8)2

1-Value is % mass 174 2-Value is % mass 176

THIS TUNE APPLIES TO THE FOLLOWING SAMPLES, MS, MSD, BLANKS, AND STANDARDS:

	EPA SAMPLE NO.	LAB SAMPLE ID	LAB FILE ID	DATE ANALYZED	TIME ANALYZED
01	VSTD010C	C1013A	C1013A	10/13/89	1018
02	VBLK3	90W062RB	B1013	10/13/89	1055
03	LV924-07	90W057	89I0301	10/13/89	1138
04	LV924-08	90W058	89I0302	10/13/89	1304
05	LV924-10	90W059	89I0303	10/13/89	1338

6A

VOLATILE ORGANICS INITIAL CALIBRATION DATA

Lab Name: REGION IX EPA Contract: SUPERFUND

Lab Code: FINN Case No.: LV921 SAS No.: _____ SDG No.: 921-04

Instrument ID: FINN Calibration Date(s): 10/03/89 10/03/89

Matrix:(soil/water) WATER Level:(low/med) LOW Column:(pack/cap) CAP

Min RRF for SPCC(#)* = 0.300 (0.250 for Bromoform) Max %RSD for CCC(*) = 30.0%

* N/A for Bromoform + 1,1,2,2-Tetrachloroethane (DD) ethane

LAB FILE ID: ~~RRF20~~ = C1003EE ~~RRF50~~ = C1003D ~~RRF200~~= C1003A

~~RRF100~~= C1003C ~~RRF150~~= C1003B

RRF04 RRF10 RRF20 RRF30 RRF40 RRF30 RRF40

COMPOUND		RRF~~20~~ 04	RRF~~50~~ 10	RRF~~100~~ 20	RRF~~150~~ 30	RRF~~200~~ 40	RRF	% RSD	
Chloromethane	#	1.015	1.042	0.916	0.980	0.885	0.968	6.8	#
Bromomethane		2.695	2.830	2.516	2.527	2.479	2.609	5.7	
Vinyl Chloride	*	1.129	1.208	1.081	1.092	0.932	1.088	9.2	*
Chloroethane		1.887	1.848	1.636	1.653	1.607	1.726	7.6	
Methylene Chloride		2.580	2.054	1.802	1.809	1.814	2.012	16.7	
Acetone		0.251	0.262	0.143	0.203	0.191	0.210	22.9	
Carbon Disulfide		7.118	7.356	6.906	7.299	6.776	7.091	3.5	
1,1-Dichloroethene	*	3.675	3.454	3.197	3.295	3.228	3.370	5.9	*
1,1-Dichloroethane	#	4.783	4.865	4.551	4.738	4.619	4.711	2.7	#
1,2-Dichloroethene (total)		3.154	2.991	2.761	2.879	2.820	2.921	5.3	
Chloroform	*	4.442	4.389	4.275	4.284	4.191	4.316	2.3	*
1,2-Dichloroethane		1.281	1.258	1.212	1.235	1.202	1.238	2.6	
1,2-Dibromoethane		0.248	0.229	0.223	0.228	0.229	0.231	4.2	
1,2-Dibromo-3-Chloropropane		0.027	0.029	0.029	0.029	0.030	0.029	3.8	
2-Butanone		0.034	0.054	0.075	0.082	0.078	0.065	31.1	
1,1,1-Trichloroethane		0.535	0.533	0.515	0.508	0.490	0.516	3.6	
Carbon Tetrachloride		0.728	0.623	0.699	0.697	0.629	0.675	6.9	
Vinyl Acetate		0.201	0.174	0.185	0.192	0.200	0.190	5.9	
Bromodichloromethane		0.315	0.302	0.315	0.317	0.321	0.314	2.3	
1,2-Dichloropropane	*	0.247	0.219	0.224	0.223	0.225	0.228	4.9	*
cis-1,3-Dichloropropene		0.311	0.255	0.275	0.264	0.251	0.271	8.9	
Trichloroethene		0.509	0.482	0.474	0.471	0.469	0.481	3.4	
Dibromochloromethane		0.277	0.252	0.269	0.267	0.271	0.267	3.5	
1,1,2-Trichloroethane		0.149	0.131	0.135	0.134	0.125	0.135	6.6	
Benzene		0.856	0.810	0.800	0.798	0.785	0.810	3.4	
trans-1,3-Dichloropropene		0.177	0.167	0.173	0.174	0.172	0.173	2.1	
Bromoform	#	0.164	0.157	0.167	0.174	0.182	0.169	5.7	#
4-Methyl-2-Pentanone		0.096	0.080	0.073	0.075	0.074	0.080	11.9	
2-Hexanone		0.090	0.064	0.072	0.069	0.073	0.074	13.3	
Tetrachloroethene		0.886	0.865	0.814	0.822	0.822	0.842	3.8	
1,1,2,2-Tetrachloroethane	#	0.211	0.186	0.189	0.193	0.198	0.195	5.0	#
Toluene	*	0.865	0.825	0.799	0.807	0.800	0.819	3.4	*
Chlorobenzene	#	1.072	1.004	0.987	1.006	1.000	1.014	3.3	#
Ethylbenzene	*	0.585	0.544	0.539	0.543	0.537	0.550	3.6	*
Styrene		0.799	0.760	0.773	0.783	0.777	0.778	1.8	
Total Xylenes		0.607	0.578	0.563	0.581	0.585	0.583	2.7	
1,3-Dichlorobenzene		0.635	0.615	0.668	0.669	0.676	0.653	4.0	
1,4-Dichlorobenzene		1.086	1.121	1.025	1.032	1.031	1.059	4.0	
1,2-Dichlorobenzene		0.602	0.625	0.629	0.637	0.639	0.626	2.4	

Toluene-d8	1.396	1.363	1.337	1.333	1.320	1.350	2.2
BFB	0.585	0.573	0.589	0.582	0.572	0.580	1.3
1,2-Dichloroethane-d4	1.130	1.241	1.260	1.375	1.309	1.263	7.2

6A

VOLATILE ORGANICS INITIAL CALIBRATION DATA

Lab Name: REGION IX EPA Contract: WS-25

Lab Code: FINN Case No.: WS-25 SAS No.: _____ SDG No.: CONC1

Instrument ID: FINN Calibration Date(s): 10/12/89 10/12/89

Matrix:(soil/water) _____ Level:(low/med) LOW Column:(pack/cap) CAP

Min $\overline{RRF}$ for SPCC(#)* = 0.300 (0.250 for Bromoform) Max %RSD for CCC(*) = 30.0%

N/A (PD) RRF 04 RRF 10

LAB FILE ID: ~~RRF20~~ = C1012E ~~RRF50~~ = C1012D

~~RRF100~~= C1012C RRF150= C1012BB ~~RRF200~~= C1012A

RRF 20 RRF 30 RRF 40

COMPOUND		RRF04 ~~RRF20~~	RRF10 ~~RRF50~~	RRF20 ~~RRF100~~	RRF30 ~~RRF150~~	RRF40 ~~RRF200~~	$\overline{RRF}$	% RSD	
Chloromethane	#	1.094	1.050	0.851	1.035	0.841	0.974	12.2	#
Bromomethane		2.999	2.685	2.481	2.389	2.282	2.567	11.0	
Vinyl Chloride	*	1.184	1.293	1.029	1.254	0.957	1.143	12.7	*
Chloroethane		1.804	1.681	1.526	1.457	1.410	1.576	10.4	
Methylene Chloride		2.071	1.796	1.592	1.519	1.457	1.687	14.8	
Acetone		0.241	0.207	0.207	0.212	0.208	0.215	6.8	
Carbon Disulfide		6.638	6.182	6.209	6.255	5.802	6.217	4.8	
1,1-Dichloroethene	*	3.631	3.510	3.287	3.075	3.007	3.302	8.2	*
1,1-Dichloroethane	#	4.923	4.730	4.577	4.489	4.432	4.630	4.3	#
1,2-Dichloroethene (total)		2.902	2.703	2.681	2.561	2.480	2.665	6.0	
Chloroform	*	4.938	4.671	4.501	4.563	4.553	4.645	3.8	*
1,2-Dichloroethane		1.772	1.574	1.414	1.450	1.494	1.541	9.2	
1,2-Dibromoethane		0.268	0.249	0.252	0.228	0.254	0.250	5.8	
1,2-Dibromo-3-Chloropropane		0.028	0.030	0.035	0.031	0.034	0.032	9.0	
2-Butanone		0.020	0.046	0.075	0.072	0.080	0.059	42.8	
1,1,1-Trichloroethane		0.749	0.690	0.711	0.673	0.672	0.699	4.6	
Carbon Tetrachloride		0.842	0.828	0.977	0.828	0.920	0.879	7.6	
Vinyl Acetate		0.193	0.179	0.190	0.183	0.213	0.192	6.9	
Bromodichloromethane		0.344	0.357	0.356	0.340	0.384	0.356	4.8	
1,2-Dichloropropane	*	0.231	0.204	0.214	0.205	0.223	0.215	5.4	*
cis-1,3-Dichloropropene		0.309	0.301	0.281	0.286	0.316	0.299	5.0	
Trichloroethene		0.533	0.480	0.493	0.470	0.465	0.488	5.6	
Dibromochloromethane		0.306	0.280	0.278	0.297	0.348	0.302	9.4	
1,1,2-Trichloroethane		0.132	0.135	0.121	0.123	0.140	0.130	6.2	
Benzene		0.846	0.794	0.786	0.754	0.744	0.785	5.1	
trans-1,3-Dichloropropene		0.194	0.186	0.170	0.179	0.215	0.189	9.1	
Bromoform	#	0.182	0.180	0.194	0.184	0.226	0.193	9.9	#
4-Methyl-2-Pentanone		0.067	0.094	0.086	0.083	0.101	0.086	14.9	
2-Hexanone		0.054	0.066	0.057	0.063	0.079	0.064	15.2	
Tetrachloroethene		1.022	0.940	0.954	0.869	0.845	0.926	7.6	
1,1,2,2-Tetrachloroethane	#	0.210	0.200	0.195	0.185	0.207	0.199	5.0	#
Toluene	*	0.923	0.886	0.876	0.813	0.816	0.863	5.5	*
Chlorobenzene	#	1.070	1.011	0.991	0.946	0.966	0.997	4.8	#
Ethylbenzene	*	0.633	0.581	0.546	0.532	0.544	0.567	7.2	*
Styrene		0.818	0.772	0.734	0.731	0.780	0.767	4.7	
Total Xylenes		0.646	0.631	0.610	0.581	0.586	0.611	4.6	
1,3-Dichlorobenzene		0.722	0.706	0.647	0.607	0.612	0.659	8.0	
1,4-Dichlorobenzene		1.033	1.063	1.101	1.017	1.105	1.064	3.7	
1,2-Dichlorobenzene		0.718	0.660	0.667	0.615	0.660	0.664	5.5	

Toluene-d8	1.393	1.439	1.473	1.404	1.374	1.417	2.8
BFB	0.609	0.642	0.633	0.611	0.668	0.633	3.8
1,2-Dichloroethane-d4	1.539	1.621	1.567	1.579	1.692	1.600	3.7

7A

VOLATILE CONTINUING CALIBRATION CHECK

Lab Name: REGIONIX EPA Contract: SUPERFUND

Lab Code: FINN Case No.: LV924 SAS No.: _____ SDG No.: 924-01

Instrument ID: FINN Calibration date: 10/09/89 Time: 1032

Lab File ID: C1009 Init. Calib. Date(s): 10/03/89 10/03/89

Matrix:(soil/water) WATER Level:(low/med) LOW Column:(pack/cap) CAP

Min RRF50 for SPCC(#) = 0.300 (0.250 for Bromoform) Max %D for CCC(*) = 25.0%

COMPOUND		RRF	RRF10 ~~RRF50~~	%D	
Chloromethane	#	0.968	1.091	-12.7	#
Bromomethane		2.609	2.744	-5.2	
Vinyl Chloride	*	1.088	1.270	-16.7	*
Chloroethane		1.726	1.834	-6.3	
Methylene Chloride		2.012	2.022	-0.5	
Acetone		0.210	0.193	8.1	
Carbon Disulfide		7.091	7.484	-5.5	
1,1-Dichloroethene	*	3.370	3.594	-6.6	*
1,1-Dichloroethane	#	4.711	4.774	-1.3	#
1,2-Dichloroethene (total)		2.921	3.105	-6.3	
Chloroform	*	4.316	4.271	1.0	*
1,2-Dichloroethane		1.238	1.205	2.7	
1,2-Dibromoethane		0.231	0.230	0.4	
1,2-Dibromo-3-Chloropropane		0.029	0.028	3.4	
2-Butanone		0.065	0.073	-12.3	
1,1,1-Trichloroethane		0.516	0.513	0.6	
Carbon Tetrachloride		0.675	0.681	-0.9	
Vinyl Acetate		0.190	0.195	-2.6	
Bromodichloromethane		0.314	0.277	11.8	
1,2-Dichloropropane	*	0.228	0.225	1.3	*
cis-1,3-Dichloropropene		0.271	0.296	-9.2	
Trichloroethene		0.481	0.488	-1.5	
Dibromochloromethane		0.267	0.249	6.7	
1,1,2-Trichloroethane		0.135	0.137	-1.5	
Benzene		0.810	0.838	-3.5	
trans-1,3-Dichloropropene		0.173	0.170	1.7	
Bromoform	#	0.169	0.152	10.1	#
4-Methyl-2-Pentanone		0.080	0.094	-17.5	
2-Hexanone		0.074	0.076	-2.7	
Tetrachloroethene		0.842	0.845	-0.4	
1,1,2,2-Tetrachloroethane	#	0.195	0.190	2.6	#
Toluene	*	0.819	0.885	-8.1	*
Chlorobenzene	#	1.014	1.029	-1.5	#
Ethylbenzene	*	0.550	0.562	-2.2	*
Styrene		0.778	0.772	0.8	
Total Xylenes		0.583	0.574	1.5	
1,3-Dichlorobenzene		0.653	0.663	-1.5	
1,4-Dichlorobenzene		1.059	1.022	3.5	
1,2-Dichlorobenzene		0.626	0.604	3.5	

8A

VOLATILE INTERNAL STANDARD AREA SUMMARY

Lab Name: REGION IX EPA Contract: SUPERFUND

Lab Code: FINN Case No.: LV924 SAS No.: _____ SDG No.: 924-01

Lab File ID (Standard): C1013A Date Analyzed: 10/13/89

Instrument ID: FINN Time Analyzed: 1018

Matrix:(soil/water) WATER Level:(low/med) LOW Column:(pack/cap) CAP

		IS1(BCM) AREA #	RT	IS2(DFB) AREA #	RT	IS3(CBZ) AREA #	RT
	12 HOUR STD	46000	7.05	320000	9.14	228000	14.24
	UPPER LIMIT	92000		640000		456000	
	LOWER LIMIT	23000		160000		114000	
	EPA SAMPLE NO.						
01	LV924-07	60000	7.08	320000	9.17	256000	14.24
02	LV924-08	63100	7.07	327000	9.15	270000	14.24
03	LV924-10	53600	7.08	283000	9.15	198000	14.25
04	VBLK3	43600	7.10	302000	9.17	216000	14.25

IS1 (BCM) = Bromochloromethane
IS2 (DFB) = 1,4-Difluorobenzene
IS3 (CBZ) = Chlorobenzene

UPPER LIMIT = + 100% of internal standard area.
LOWER LIMIT = - 50% of internal standard area.

Column used to flag internal standard area values with an asterisk

8A

VOLATILE INTERNAL STANDARD AREA SUMMARY

Lab Name: REGION IX EPA Contract: SUPERFUND

Lab Code: FINN Case No.: LV924 SAS No.: _____ SDG No.: 924-01

Lab File ID (Standard): C1010 Date Analyzed: 10/10/89

Instrument ID: FINN Time Analyzed: 1336

Matrix:(soil/water) WATER Level:(low/med) LOW Column:(pack/cap) CAP

		IS1(BCM) AREA #	RT	IS2(DFB) AREA #	RT	IS3(CBZ) AREA #	RT
	12 HOUR STD	55200	7.10	346000	9.15	266000	14.25
	UPPER LIMIT	110400		692000		532000	
	LOWER LIMIT	27600		173000		133000	
	EPA SAMPLE NO.						
01	LV924-04	50200	7.08	302000	9.15	225000	14.25
02	LV924-09	51000	7.08	300000	9.17	218000	14.25
03	LV924-04DS	62800	7.10	316000	9.17	250000	14.24
04	LV924-04MS	62300	7.10	322000	9.19	250000	14.25
05	VBLK2	50300	7.10	311000	9.17	232000	14.24

IS1 (BCM) = Bromochloromethane
IS2 (DFB) = 1,4-Difluorobenzene
IS3 (CBZ) = Chlorobenzene

UPPER LIMIT = + 100% of internal standard area.
LOWER LIMIT = - 50% of internal standard area.

Column used to flag internal standard area values with an asterisk

8A

VOLATILE INTERNAL STANDARD AREA SUMMARY

Lab Name: REGION IX EPA Contract: SUPERFUND

Lab Code: FINN Case No.: LV924 SAS No.: _____ SDG No.: 924-01

Lab File ID (Standard): C1009 Date Analyzed: 10/09/89

Instrument ID: FINN Time Analyzed: 1032

Matrix:(soil/water) WATER Level:(low/med) LOW Column:(pack/cap) CAP

		IS1(BCM) AREA #	RT	IS2(DFB) AREA #	RT	IS3(CBZ) AREA #	RT
	12 HOUR STD	63900	7.07	439000	9.14	322000	14.22
	UPPER LIMIT	127800		878000		644000	
	LOWER LIMIT	31950		219500		161000	
	EPA SAMPLE NO.						
01	LV924-01	50500	7.07	354000	9.15	257000	14.24
02	LV924-02	53200	7.10	344000	9.14	262000	14.24
03	LV924-03	55700	7.05	318000	9.14	245000	14.24
04	LV924-05	56100	7.07	310000	9.15	245000	14.24
05	LV924-06	55800	7.08	307000	9.15	232000	14.24
06	VBLK1	55100	7.07	383000	9.14	271000	14.22

IS1 (BCM) = Bromochloromethane
IS2 (DFB) = 1,4-Difluorobenzene
IS3 (CBZ) = Chlorobenzene

UPPER LIMIT = + 100% of internal standard area.
LOWER LIMIT = - 50% of internal standard area.

Column used to flag internal standard area values with an asterisk

7A

VOLATILE CONTINUING CALIBRATION CHECK

Lab Name: REGIONIX EPA Contract: SUPERFUND

Lab Code: FINN Case No.: LV924 SAS No.: _____ SDG No.: 924-01

Instrument ID: FINN Calibration date: 10/10/89 Time: 1336

Lab File ID: C1010 Init. Calib. Date(s): 10/03/89 10/03/89

Matrix:(soil/water) WATER Level:(low/med) LOW Column:(pack/cap) CAP

Min RRF50 for SPCC(#)* = 0.300 (0.250 for Bromoform) Max %D for CCC(*) = 25.0%

COMPOUND		RRF	RRF10 ~~RRF50~~	%D	
Chloromethane	#	0.968	0.830	14.3	#
Bromomethane		2.609	2.595	0.5	
Vinyl Chloride	*	1.088	0.979	10.0	*
Chloroethane		1.726	1.724	0.1	
Methylene Chloride		2.012	1.801	10.5	
Acetone		0.210	0.180	14.3	
Carbon Disulfide		7.091	6.199	12.6	
1,1-Dichloroethene	*	3.370	3.279	2.7	*
1,1-Dichloroethane	#	4.711	4.494	4.6	#
1,2-Dichloroethene (total)		2.921	2.636	9.8	
Chloroform	*	4.316	4.096	5.1	*
1,2-Dichloroethane		1.238	1.202	2.9	
1,2-Dibromoethane		0.231	0.241	-4.3	
1,2-Dibromo-3-Chloropropane		0.029	0.027	6.9	
2-Butanone		0.065	0.062	4.6	
1,1,1-Trichloroethane		0.516	0.510	1.2	
Carbon Tetrachloride		0.675	0.586	13.2	
Vinyl Acetate		0.190	0.206	-8.4	
Bromodichloromethane		0.314	0.353	-12.4	
1,2-Dichloropropane	*	0.228	0.222	2.6	*
cis-1,3-Dichloropropene		0.271	0.328	-21.0	
Trichloroethene		0.481	0.466	3.1	
Dibromochloromethane		0.267	0.271	-1.5	
1,1,2-Trichloroethane		0.135	0.154	-14.1	
Benzene		0.810	0.832	-2.7	
trans-1,3-Dichloropropene		0.173	0.194	-12.1	
Bromoform	#	0.169	0.158	6.5	#
4-Methyl-2-Pentanone		0.080	0.094	-17.5	
2-Hexanone		0.074	0.083	-12.2	
Tetrachloroethene		0.842	0.822	2.4	
1,1,2,2-Tetrachloroethane	#	0.195	0.217	-11.3	#
Toluene	*	0.819	0.858	-4.8	*
Chlorobenzene	#	1.014	1.000	1.4	#
Ethylbenzene	*	0.550	0.528	4.0	*
Styrene		0.778	0.763	1.9	
Total Xylenes		0.583	0.574	1.5	
1,3-Dichlorobenzene		0.653	0.660	-1.1	
1,4-Dichlorobenzene		1.059	1.018	3.9	
1,2-Dichlorobenzene		0.626	0.638	-1.9	

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION IX
215 Fremont Street
San Francisco, Ca. 94105

MEMORANDUM

DATE: 11/29/89

SUBJECT: Request for Unvalidated Data Table 1 and/or Data Validation

FROM: Dave Bingham, QAMS

TO: ICF

EPAs Copy of Forms

[X] Request for Unvalidated Data Table 1
[ ] Request for Data Validation

Please return this form with the completed task.

Site: PHELPS-DODGE Project: _____ Program: SF

Lab: REGION 9 Case #: LV924 SAS #: _____ Memo #: 1 SMC.

Analyses: Metals: AS, PB, HG, SE, TL Matrix: W Number: 11

Date Received: 11/29/89 [ ] Entered

Site ID Number:

Dates Sampled: 10/5, 10/6/89

Describe the analyses and list the sample numbers for this data package:
LV924 - 15 → 24

Blanks: LV924-21 FB, -22 EB (10/6/89), -23 EB, -24 FB
Bckgrd: LV924-13
Duplicates: LV924-15 / LV924-16

Project Officer:
Sampler:

Task Completed: / / Transmit Table 1A: / / [ ] Entered

Data Validation Requested: / / Validation Assigned: / / Days Due: Due Date: / /

Reviewer/Staff: _____ [ ] Entered Task Completed: / /

Completed and Sent to RPM: / / Late: _____ [ ] Entered

Please indicate if the laboratory did not comply with the contract and/or if the SAS request was not adequate:

U.S. EPA - CLP

2A
INITIAL AND CONTINUING CALIBRATION VERIFICATION

Lab Name: LESC_____ Contract: 68-03-3249

Lab Code: LESC__ Case No.: LV924 SAS No.: _____ SDG No:LV924-15

Initial Calibration Source: UNLV,NBS,INT

Continuing Calibration Source: INTERNAL____

Concentration Units: ug/L

Analyte	Initial Calibration True	Found	%R(1)	Continuing Calibration True	Found	%R(1)	Found	%R(1)	M
Aluminum	2000.0	2146.30	107.3	5000.0	5083.90	101.7	4963.10	99.3	P
Antimony	1010.0	1056.40	104.6	5000.0	5034.80	100.7	5106.90	102.1	P
Arsenic	100.0	106.50	106.5	50.0	52.30	104.6	50.70	101.4	F
Barium	2010.0	1951.20	97.1	500.0	502.60	100.5	507.40	101.5	P
Beryllium	501.0	460.40	91.9	500.0	504.90	101.0	511.90	102.4	P
Cadmium	492.0	502.90	102.2	5000.0	5049.10	101.0	5148.30	103.0	P
Calcium	50200.0	49452.40	98.5	25000.0	24552.70	98.2	24371.10	97.5	P
Chromium	503.0	506.80	100.8	5000.0	5058.00	101.2	5162.10	103.2	P
Cobalt	498.0	503.60	101.1	5000.0	5054.00	101.1	5140.90	102.8	P
Copper	520.0	525.20	101.0	5000.0	4967.60	99.4	4973.60	99.5	P
Iron	2081.0	2053.20	98.7	5000.0	5034.40	100.7	5171.30	103.4	P
Lead	100.0	96.70	96.7	50.0	47.70	95.4	48.50	97.0	F
Magnesium	25700.0	25716.20	100.1	25000.0	25028.20	100.1	25070.40	100.3	P
Manganese	504.0	534.20	106.0	5000.0	5016.00	100.3	5079.60	101.6	P
Mercury	3.8	3.30	86.8	5.0	4.73	94.6	4.65	93.0	AV
Nickel	485.0	475.60	98.1	5000.0	5042.90	100.9	5119.20	102.4	P
Potassium	50200.0	51752.00	103.1	25000.0	24442.50	97.8	24354.50	97.4	P
Selenium	100.0	101.90	101.9	50.0	46.10	92.2	46.10	92.2	F
Silver	484.0	463.60	95.8	1000.0	1006.60	100.7	1012.20	101.2	P
Sodium	51500.0	51112.70	99.2	25000.0	24346.10	97.4	24230.80	96.9	P
Thallium	50.0	45.90	91.8	25.0	24.90	99.6	24.70	98.8	F
Vanadium	505.0	504.20	99.8	5000.0	5035.20	100.7	5118.80	102.4	P
Zinc	2920.0	2902.60	99.4	5000.0	5089.50	101.8	5189.00	103.8	P
Cyanide									NR

(1) Control Limits: Mercury 80-120; Other Metals 90-110; Cyanide 85-115

U.S. EPA - CLP

2A

INITIAL AND CONTINUING CALIBRATION VERIFICATION

Lab Name: LESC_____ Contract: 68-03-3249

Lab Code: LESC__ Case No.: LV924 SAS No.: _____ SDG No:LV924-15

Initial Calibration Source: UNLV,NBS,INT

Continuing Calibration Source: INTERNAL____

Concentration Units: ug/L

Analyte	Initial Calibration True	Initial Calibration Found	Initial Calibration %R(1)	Continuing Calibration True	Continuing Calibration Found	Continuing Calibration %R(1)	Continuing Calibration Found	Continuing Calibration %R(1)	M
Aluminum				5000.0	4949.40	99.0	4933.90	98.7	P
Antimony				5000.0	5041.40	100.8	5037.30	100.7	P
Arsenic				50.0	49.90	99.8	48.00	96.0	F
Barium				500.0	505.40	101.1	506.20	101.2	P
Beryllium				500.0	508.80	101.8	510.20	102.0	P
Cadmium				5000.0	5101.00	102.0	5104.00	102.1	P
Calcium				25000.0	24701.50	98.8	24293.10	97.2	P
Chromium				5000.0	5068.60	101.4	5093.90	101.9	P
Cobalt				5000.0	5050.60	101.0	5068.50	101.4	P
Copper				5000.0	4964.60	99.3	4952.80	99.1	P
Iron				5000.0	4937.50	98.8	4803.00	96.1	P
Lead				50.0	50.40	100.8	48.60	97.2	F
Magnesium				25000.0	25010.10	100.0	24943.70	99.8	P
Manganese				5000.0	4958.50	99.2	4976.50	99.5	P
Mercury									NR
Nickel				5000.0	5071.10	101.4	5071.90	101.4	P
Potassium				25000.0	24447.40	97.8	24196.30	96.8	P
Selenium				50.0	45.00	90.0	45.40	90.8	F
Silver				1000.0	998.20	99.8	1002.70	100.3	P
Sodium				25000.0	24402.40	97.6	24146.50	96.6	P
Thallium				25.0	24.30	97.2	25.20	100.8	F
Vanadium				5000.0	5049.90	101.0	5070.20	101.4	P
Zinc				5000.0	5046.30	100.9	5078.40	101.6	P
Cyanide									NR

(1) Control Limits: Mercury 80-120; Other Metals 90-110; Cyanide 85-115

U.S. EPA - CLP

2A
INITIAL AND CONTINUING CALIBRATION VERIFICATION

Lab Name: LESC Contract: 68-03-3249

Lab Code: LESC Case No.: LV924 SAS No.: SDG No:LV924-15

Initial Calibration Source: UNLV,NBS,INT

Continuing Calibration Source: INTERNAL

Concentration Units: ug/L

Analyte	Initial Calibration True	Found	%R(1)	Continuing Calibration True	Found	%R(1)	Found	%R(1)	M
Aluminum				5000.0	4909.90	98.2	5103.40	102.1	P
Antimony				5000.0	5057.60	101.2	5039.20	100.8	P
Arsenic	100.0	105.70	105.7	50.0	51.00	102.0	48.80	97.6	F
Barium				500.0	507.80	101.6	502.50	100.5	P
Beryllium				500.0	512.80	102.6	505.30	101.1	P
Cadmium				5000.0	5152.30	103.0	5057.80	101.2	P
Calcium				25000.0	24493.00	98.0	24649.30	98.6	P
Chromium				5000.0	5106.70	102.1	5026.80	100.5	P
Cobalt				5000.0	5096.30	101.9	5026.10	100.5	P
Copper				5000.0	4972.30	99.4	4945.70	98.9	P
Iron				5000.0	4897.50	98.0	5029.50	100.6	P
Lead	100.0	99.10	99.1	50.0	50.20	100.4	49.80	99.6	F
Magnesium				25000.0	25106.60	100.4	25148.90	100.6	P
Manganese				5000.0	4990.80	99.8	4921.80	98.4	P
Mercury									NR
Nickel				5000.0	5128.90	102.6	5056.90	101.1	P
Potassium				25000.0	24358.50	97.4	24518.30	98.1	P
Selenium	100.0	94.80	94.8	50.0	51.70	103.4	48.90	97.8	F
Silver				1000.0	995.70	99.6	999.10	99.9	P
Sodium				25000.0	24219.40	96.9	24323.90	97.3	P
Thallium	50.0	49.40	98.8	25.0	23.40	93.6	23.40	93.6	F
Vanadium				5000.0	5080.00	101.6	5015.50	100.3	P
Zinc				5000.0	5098.80	102.0	5037.70	100.8	P
Cyanide									NR

1) Control Limits: Mercury 80-120; Other Metals 90-110; Cyanide 85-115

U.S. EPA - CLP

2A
INITIAL AND CONTINUING CALIBRATION VERIFICATION

ab Name: LESC_____ Contract: 68-03-3249

ab Code: LESC__ Case No.: LV924 SAS No.: _____ SDG No:LV924-15

nitial Calibration Source: UNLV,NBS,INT

ontinuing Calibration Source: INTERNAL____

Concentration Units: ug/L

Analyte	Initial Calibration True	Found	%R(1)	Continuing Calibration True	Found	%R(1)	Found	%R(1)	M
Aluminum									NR
Antimony									NR
Arsenic									NR
Barium									NR
Beryllium									NR
Cadmium									NR
Calcium									NR
Chromium									NR
Cobalt									NR
Copper									NR
Iron									NR
Lead									NR
Magnesium									NR
Manganese									NR
Mercury									NR
Nickel									NR
Potassium									NR
Selenium	100.0	98.50	98.5	50.0	51.10	102.2	49.70	99.4	F
Silver									NR
Sodium									NR
Thallium									NR
Vanadium									NR
Zinc									NR
Cyanide									NR

1) Control Limits: Mercury 80-120; Other Metals 90-110; Cyanide 85-115

U.S. EPA - CLP

2B
CRDL STANDARD FOR AA AND ICP

ab Name: LESC_____ Contract: 68-03-3249

ab Code: LESC__ Case No.: LV924 SAS No.: _____ SDG No:LV924-15

A CRDL Standard Source: INTERNAL____

CP CRDL Standard Source: INTERNAL____

Concentration Units: ug/L

Analyte	CRDL Standard for AA			CRDL Standard for ICP				
	True	Found	%R	Initial True	Initial Found	Initial %R	Final Found	Final %R
Aluminum				400.0	439.40	109.8	434.80	108.7
Antimony								
Arsenic	10.0	9.80	98.0					
Barium				200.0	202.80	101.4	202.00	101.0
Beryllium				10.0	10.20	102.0	10.10	101.0
Cadmium				10.0	11.70	117.0	10.60	106.0
Calcium				10000.0	10141.40	101.4	10013.30	100.1
Chromium				20.0	21.00	105.0	23.70	118.5
Cobalt				100.0	109.50	109.5	113.50	113.5
Copper				50.0	51.60	103.2	51.30	102.6
Iron				200.0	127.20	63.6	253.20	126.6
Lead	5.0	4.40	88.0					
Magnesium				10000.0	10700.50	107.0	10682.40	106.8
Manganese				30.0	34.10	113.7	34.70	115.7
Mercury								
Nickel				80.0	60.30	75.4	70.90	88.6
Potassium				10000.0	9977.10	99.8	9809.90	98.1
Selenium	5.0	3.90	78.0					
Silver				20.0	21.90	109.5	22.20	111.0
Sodium				10000.0	9950.00	99.5	9749.50	97.5
Thallium	10.0	9.30	93.0					
Vanadium				100.0	102.40	102.4	103.70	103.7
Zinc				40.0	42.90	107.2	43.60	109.0

U.S. EPA - CLP

2B
CRDL STANDARD FOR AA AND ICP

Lab Name: LESC_____ Contract: 68-03-3249

Lab Code: LESC__ Case No.: LV924 SAS No.: _____ SDG No:LV924-15

AA CRDL Standard Source: INTERNAL____

ICP CRDL Standard Source: INTERNAL____

Concentration Units: ug/L

Analyte	CRDL Standard for AA			CRDL Standard for ICP				
	True	Found	%R	True	Initial Found	%R	Final Found	%R
Aluminum								
Antimony								
Arsenic	10.0	8.80	88.0					
Barium								
Beryllium								
Cadmium								
Calcium								
Chromium								
Cobalt								
Copper								
Iron								
Lead	5.0	4.90	98.0					
Magnesium								
Manganese								
Mercury								
Nickel								
Potassium								
Selenium	5.0	4.70	94.0					
Silver								
Sodium								
Thallium	10.0	9.70	97.0					
Vanadium								
Zinc								

U.S. EPA - CLP

2B
CRDL STANDARD FOR AA AND ICP

Lab Name: LESC_____ Contract: 68-03-3249

Lab Code: LESC__ Case No.: LV924 SAS No.: _____ SDG No:LV924-15

AA CRDL Standard Source: INTERNAL____

ICP CRDL Standard Source: INTERNAL____

Concentration Units: ug/L

Analyte	CRDL Standard for AA			CRDL Standard for ICP				
	True	Found	%R	True	Initial Found	%R	Final Found	%R
Aluminum								
Antimony								
Arsenic								
Barium								
Beryllium								
Cadmium								
Calcium								
Chromium								
Cobalt								
Copper								
Iron								
Lead								
Magnesium								
Manganese								
Mercury								
Nickel								
Potassium								
Selenium	5.0	4.60	92.0					
Silver								
Sodium								
Thallium								
Vanadium								
Zinc								

U.S. EPA - CLP

3
BLANKS

Lab Name: LESC_____ Contract: 68-03-3249

Lab Code: LESC__ Case No.: LV924 SAS No.: _____ SDG No:LV924-15

Preparation Blank Matrix (soil/water): WATER

Preparation Blank Concentration Units (ug/L or mg/kg): UG/L_

Analyte	Initial Calib. Blank (ug/L)	C	Continuing Calibration Blank (ug/L) 1	C	2	C	3	C	Prepa-ration Blank	C	M
Aluminum	5.2	B	57.4	B	5.0	U	12.4	B	5.0	U	P
Antimony	30.0	U	30.0	U	30.0	U	30.0	U	30.0	U	P
Arsenic	2.0	U	2.0	U	2.0	U	2.0	U	2.0	U	F
Barium	5.0	U	5.0	U	5.0	U	5.0	U	5.0	U	P
Beryllium	1.0	U	1.0	U	1.0	U	1.0	U	1.0	U	P
Cadmium	5.0	U	5.0	U	5.0	U	5.0	U	5.0	U	P
Calcium	200.0	U	200.0	U	200.0	U	200.0	U	200.0	U	P
Chromium	5.0	U	5.0	U	5.0	U	5.0	U	5.0	U	P
Cobalt	10.0	U	10.0	U	10.0	U	10.0	U	10.0	U	P
Copper	5.0	U	5.0	U	5.0	U	5.1	B	5.0	U	P
Iron	-82.4	B	50.0	U	-61.8	B	50.0	U	50.0	U	P
Lead	2.0	U	2.0	U	2.0	U	2.0	U	2.0	U	F
Magnesium	200.0	U	200.0	U	200.0	U	200.0	U	200.0	U	P
Manganese	5.0	U	5.0	U	5.0	U	5.8	B	5.0	U	P
Mercury	0.2	U	0.2	U	0.2	U			0.2	U	AV
Nickel	30.0	U	30.0	U	30.0	U	30.0	U	30.0	U	P
Potassium	100.0	U	100.0	U	100.0	U	100.0	U	100.0	U	P
Selenium	2.0	U	2.0	U	2.0	U	2.0	U	2.0	U	F
Silver	5.0	U	5.0	U	5.0	U	5.3	B	5.0	U	P
Sodium	100.0	U	100.0	U	100.0	U	100.0	U	100.0	U	P
Thallium	2.0	U	2.0	U	2.0	U	2.0	U	2.0	U	F
Vanadium	5.0	U	5.0	U	5.0	U	5.0	U	5.0	U	P
Zinc	5.0	U	5.0	U	5.0	U	5.0	U	5.0	U	P
Cyanide											NR

U.S. EPA - CLP

3
BLANKS

Lab Name: LESC_____ Contract: 68-03-3249

Lab Code: LESC__ Case No.: LV924 SAS No.: _____ SDG No:LV924-15

Preparation Blank Matrix (soil/water): _____

Preparation Blank Concentration Units (ug/L or mg/kg): _____

Analyte	Initial Calib. Blank (ug/L)	C	Continuing Calibration Blank (ug/L) 1	C	2	C	3	C	Prepa-ration Blank	C	M
Aluminum			8.2	B	5.0	U	89.6	B			P
Antimony			30.0	U	30.0	U	30.0	U			P
Arsenic	2.0	U	2.0	U							F
Barium			5.0	U	5.0	U	5.0	U			P
Beryllium			1.0	U	1.0	U	1.0	U			P
Cadmium			5.0	U	5.0	U	5.0	U			P
Calcium			200.0	U	200.0	U	200.0	U			P
Chromium			5.0	U	5.0	U	5.0	U			P
Cobalt			10.0	U	10.0	U	10.0	U			P
Copper			5.0	U	5.0	U	5.0	U			P
Iron			50.0	U	50.0	U	50.0	U			P
Lead	2.0	U	2.0	U							F
Magnesium			200.0	U	200.0	U	200.0	U			P
Manganese			5.0	U	5.0	U	5.0	U			P
Mercury											NR
Nickel			30.0	U	30.0	U	30.0	U			P
Potassium			100.0	U	100.0	U	100.0	U			P
Selenium	2.0	U	2.0	U							F
Silver			5.0	U	5.0	U	5.0	U			P
Sodium			100.0	U	100.0	U	100.0	U			P
Thallium	2.0	U	2.0	U							F
Vanadium			5.0	U	5.0	U	5.0	U			P
Zinc			5.0	U	5.0	U	5.0	U			P
Cyanide											NR

U.S. EPA - CLP

4

ICP INTERFERENCE CHECK SAMPLE

Lab Name: LESC_____ Contract: 68-03-3249

Lab Code: LESC__ Case No.: LV924 SAS No: _____ SDG No:LV924-15

ICP ID Number: ARL3560_____ ICS Source: UNLV1287____

Concentration Units: ug/L

Analyte	True Sol. A	True Sol. AB	Initial Found Sol. A	Initial Found Sol. AB	Initial Found %R	Final Found Sol. A	Final Found Sol. AB	Final Found %R
Aluminum	511000	508000	480680	482042.8	94.9	475861	477782.2	94.1
Antimony	0	0	40	38.7		-1	32.5	
Arsenic								
Barium	0	483	1	481.7	99.7	1	479.6	99.3
Beryllium	0	474	0	426.9	90.1	0	426.3	89.9
Cadmium	0	909	8	947.7	104.3	8	953.6	104.9
Calcium	476000	470000	427513	429236.4	91.3	425691	425643.9	90.6
Chromium	0	513	12	500.8	97.6	8	495.0	96.5
Cobalt	0	478	7	488.8	102.3	3	482.0	100.8
Copper	0	534	9	548.8	102.8	8	540.8	101.3
Iron	219000	211000	236830	237563.9	112.6	233967	235269.6	111.5
Lead								
Magnesium	513000	513000	521222	522591.8	101.9	519592	521149.4	101.6
Manganese	0	470	8	508.7	108.2	4	497.6	105.9
Mercury								
Nickel	0	916	7	898.4	98.1	-10	895.7	97.8
Potassium	0	0	267	279.6		278	270.6	
Selenium								
Silver	0	934	1	980.5	105.0	1	974.9	104.4
Sodium	0	0	127	172.4		148	126.2	
Thallium								
Vanadium	0	475	-24	473.3	99.6	-26	469.5	98.8
Zinc	0	973	-1	930.7	95.7	-2	922.0	94.8

U.S. EPA - CLP

5A
SPIKE SAMPLE RECOVERY

EPA SAMPLE NO.
LV924-19 S

Lab Name: LESC Contract: 68-03-3249

Lab Code: LESC Case No.: LV924 SAS No.: SDG No:LV924-15

Matrix (scil/water): WATER Level (low/med):

Concentration Units (ug/L or mg/kg dry weight): UG/L

Analyte	Control Limit %R	Spiked Sample Result (SSR)	C	Sample Result (SR)	C	Spike Added (SA)	%R	Q	M
Aluminum	75-125	2281.4000		122.2000	B	2000.0	108.0		P
Antimony	75-125	522.5000		30.0000	U	500.0	104.5		P
Arsenic	75-125	44.0000		2.0000	U	40.0	110.0		F
Barium	75-125	2235.1000		89.9000	B	2000.0	107.3		P
Beryllium	75-125	51.0000		1.0000	U	50.0	102.0		P
Cadmium	75-125	55.4000		5.0000	U	50.0	110.8		P
Calcium									NR
Chromium	75-125	228.4000		5.0000	U	200.0	114.2		P
Cobalt	75-125	568.3000		10.0000	U	500.0	113.7		P
Copper	75-125	278.7000		5.0000	U	250.0	111.5		P
Iron	75-125	1224.7000		84.8000	B	1000.0	114.0		P
Lead	75-125	25.3000		2.0000	U	24.6	102.8		F
Magnesium									NR
Manganese	75-125	942.6000		420.0000		500.0	104.5		P
Mercury	75-125	0.9900		0.2000	U	1.0	99.0		AV
Nickel	75-125	572.0000		30.0000	U	500.0	114.4		P
Potassium									NR
Selenium	75-125	7.1000		2.0000	U	8.5	83.5		F
Silver	75-125	14.1000		5.0000	U	50.0	28.2	N	P
Sodium									NR
Thallium	75-125	36.4000		2.0000	U	40.0	91.0		F
Vanadium	75-125	546.3000		5.0000	U	500.0	109.3		P
Zinc	75-125	595.9000		39.2000		500.0	111.3		P
Cyanide									NR

Comments:
THESE SAMPLES WERE NOT DIGESTED. THE SPIKE WAS ADDED AFTER
FILTRATION AND BEFORE ANALYSIS.

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6
DUPLICATES

EPA SAMPLE NO.
LV924-19 D

Lab Name: LESC Contract: 68-03-3249

Lab Code: LESC Case No.: LV924 SAS No.: SDG No:LV924-15

Matrix (soil/water): WATER Level (low/med): _____

% Solids for Sample: 0 % Solids for Duplicate: 0

Concentration Units (ug/L or mg/kg dry weight): UG/L

Analyte	Control Limit	Sample (S)	C	Duplicate (D)	C	RPD	Q	M
Aluminum	200.0	122.2000	B	121.1000	B	0.9		P
Antimony	60.0	30.0000	U	30.0000	U			P
Arsenic	10.0	2.0000	U	2.0000	U			F
Barium	200.0	89.9000	B	89.9000	B	0.0		P
Beryllium	5.0	1.0000	U	1.0000	U			P
Cadmium	5.0	5.0000	U	5.0000	U			P
Calcium		68347.9000		67905.0000		0.7		P
Chromium	10.0	5.0000	U	5.0000	U			P
Cobalt	50.0	10.0000	U	10.0000	U			P
Copper	25.0	5.0000	U	5.0000	U			P
Iron	100.0	84.8000	B	103.0000		19.4		P
Lead	5.0	2.0000	U	2.0000	U			F
Magnesium	5000.0	18534.2000		18510.1000		0.1		P
Manganese		420.0000		423.3000		0.8		P
Mercury	0.2	0.2000	U	0.2000	U			AV
Nickel	40.0	30.0000	U	30.0000	U			P
Potassium	5000.0	6819.8000		6769.3000		0.7		P
Selenium	5.0	2.0000	U	2.0000	U			F
Silver	10.0	5.0000	U	5.0000	U			P
Sodium		34500.2000		34192.7000		0.9		P
Thallium	10.0	2.0000	U	2.0000	U			F
Vanadium	50.0	5.0000	U	5.0000	U			P
Zinc	20.0	39.2000		38.1000		2.8		P
Cyanide								NR

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8
STANDARD ADDITION RESULTS

Lab Name: LESC_____ Contract: 68-03-3249

Lab Code: LESC__ Case No.: LV924 SAS No.: _____ SDG No:LV924-15

Concentration Units: ug/L

EPA Sample No.	An	Dil.	0 ADD Abs	1 ADD CON	1 ADD ABS	2 ADD CON	2 ADD ABS	3 ADD CON	3 ADD ABS	Final Conc.	r	Q
V924-22	SE	1	11.200	18	23.800	36	36.900	54	48.400	16.4	0.9997	

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9
ICP SERIAL DILUTION

EPA SAMPLE NO.
LV924-16

Lab Name: LESC Contract: 68-03-3249

Lab Code: LESC Case No.: LV924 SAS No.: SDG No: LV924-15

Matrix (soil/water): WATER Level (low/med):

Concentration Units: ug/L

Analyte	Initial Sample Result (I)	C	Serial Dilution Result (S)	C	% Difference	Q	M
Aluminum	135.90	B	157.50	B	15.9		P
Antimony	30.00	U	150.00	U			NR
Arsenic							F
Barium	85.40	B	86.00	B	0.7		P
Beryllium	1.00	U	5.00	U			NR
Cadmium	5.00	U	25.00	U			NR
Calcium	76576.50		76716.50		0.2		P
Chromium	5.00	U	25.00	U			NR
Cobalt	10.00	U	50.00	U			NR
Copper	5.00	U	25.00	U			NR
Iron	50.00	U	250.00	U			NR
Lead							F
Magnesium	21105.20		20761.00	B	1.6		P
Manganese	127.90		133.00		4.0		P
Mercury							AV
Nickel	30.00	U	150.00	U			NR
Potassium	3914.50	B	3697.00	B	5.6		P
Selenium							F
Silver	5.00	U	25.00	U			NR
Sodium	18549.40		17833.00	B	3.9		P
Thallium							F
Vanadium	5.00	U	25.00	U			NR
Zinc	5.00	U	25.00	U			NR

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10
HOLDING TIMES

Lab Name: LESC_____ Contract: 68-03-3249

Lab Code: LESC__ Case No.: LV924 SAS No.: _____ SDG No:LV924-15

EPA Sample No.	Matrix	Date Received	Mercury Prep Date	Mercury Holding Time	Cyanide Prep Date	Cyanide Holding Time
LV924-15	WATER	10/07/99	10/27/89	20		
LV924-16	WATER	10/07/89	10/27/89	20		
LV924-17	WATER	10/07/89	10/27/89	20		
LV924-18	WATER	10/07/89	10/27/89	20		
LV924-19	WATER	10/07/89	10/27/89	20		
LV92419 D	WATER	10/07/89	10/27/89	20		
LV92419 S	WATER	10/07/89	10/27/89	20		
LV924-20	WATER	10/07/89	10/27/89	20		
LV924-21	WATER	10/07/89	10/27/89	20		
LV924-22	WATER	10/07/89	10/27/89	20		
LV924-22	WATER	10/12/89	10/27/89	15		
LV924-23	WATER	10/12/89	10/27/89	15		
LV924-24	WATER	10/12/89	10/27/89	15		

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11

INSTRUMENT DETECTION LIMITS (QUARTERLY)

Lab Name: LESC_____ Contract: 68-03-3249

Lab Code: LESC__ Case No.: LV924 SAS No.: _____ SDG No:LV924-15

ICP ID Number: _____ Date: 11/30/89

Flame AA ID Number : FIAAV_____

Furnace AA ID Number : PE5000_____

Analyte	Wave-length (nm)	Back-ground	CRDL (ug/L)	IDL (ug/L)	M
Aluminum			200		NR
Antimony			60		NR
Arsenic	193.78	BZ	10	2.0	F
Barium			200		NR
Beryllium			5		NR
Cadmium			5		NR
Calcium			5000		NR
Chromium			10		NR
Cobalt			50		NR
Copper			25		NR
Iron			100		NR
Lead	283.38	BZ	5	2.0	F
Magnesium			5000		NR
Manganese			15		NR
Mercury	253.78		0.2	0.2	AV
Nickel			40		NR
Potassium			5000		NR
Selenium	196.08	BZ	5	2.0	F
Silver			10		NR
Sodium			5000		NR
Thallium	276.88	BZ	10	2.0	F
Vanadium			50		NR
Zinc			20		NR

Comments:

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11

INSTRUMENT DETECTION LIMITS (QUARTERLY)

Lab Name: LESC_____ Contract: 68-03-3249

Lab Code: LESC__ Case No.: LV924 SAS No.: _____ SDG No:LV924-15

ICP ID Number: ARL3560_____ Date: 11/30/89

Flame AA ID Number : _____

Furnace AA ID Number : _____

Analyte	Wave-length (nm)	Back-ground	CRDL (ug/L)	IDL (ug/L)	M
Aluminum	396.15		200	5.0	P
Antimony	217.59		60	30.0	P
Arsenic			10		NR
Barium	455.40		200	5.0	P
Beryllium	313.11		5	1.0	P
Cadmium	226.50		5	5.0	P
Calcium	422.67		5000	200.0	P
Chromium	267.72		10	5.0	P
Cobalt	228.62		50	10.0	P
Copper	324.75		25	5.0	P
Iron	247.29		100	50.0	P
Lead			5		NR
Magnesium	279.55		5000	200.0	P
Manganese	257.61		15	5.0	P
Mercury			0.2		NR
Nickel	231.60		40	30.0	P
Potassium	766.49		5000	100.0	P
Selenium			5		NR
Silver	328.07		10	5.0	P
Sodium	589.59		5000	100.0	P
Thallium			10		NR
Vanadium	292.40		50	5.0	P
Zinc	213.86		20	5.0	P

Comments:

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12A
ICP INTERELEMENT CORRECTION FACTORS (QUARTERLY)

Lab Name: LESC_____ Contract: 68-03-3249

Lab Code: LESC__ Case No.: LV924 SAS No.: _____ SDG No:LV924-15

ICP ID Number: ARL3560_____ Date: 11/30/89

Analyte	Wave-length (nm)	Interelement Correction Factors for : Al	Ca	Fe	Mg	__
Aluminum	396.15					
Antimony	217.59					
Arsenic						
Barium	455.40					
Beryllium	313.11					
Cadmium	226.50			0.0003600		
Calcium	422.67					
Chromium	267.72					
Cobalt	228.62					
Copper	324.75					
Iron	247.29					
Lead	220.35					
Magnesium	279.55					
Manganese	257.61			0.0000676		
Mercury						
Nickel	231.60					
Potassium	766.49					
Selenium						
Silver	328.07					
Sodium	589.59					
Thallium						
Vanadium	292.40			0.0000978		
Zinc	213.86					

Comments:

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13
ICP LINEAR RANGES (QUARTERLY)

Lab Name: LESC_____ Contract: 68-03-3249

Lab Code: LESC__ Case No.: LV924 SAS No.: _____ SDG No:LV924-15

ICP ID Number: ARL3560_____ Date: 11/30/89

Analyte	Integ. Time (Sec.)	Concentration (ug/L)	M
Aluminum	10.00	100.0	
Antimony	10.00	100.0	
Arsenic			NR
Barium	10.00	100.0	
Beryllium	10.00	100.0	
Cadmium	10.00	100.0	
Calcium	10.00	100.0	
Chromium	10.00	100.0	
Cobalt	10.00	100.0	
Copper	10.00	100.0	
Iron	10.00	100.0	
Lead	10.00	100.0	
Magnesium	10.00	100.0	
Manganese	10.00	100.0	
Mercury			NR
Nickel	10.00	100.0	
Potassium	10.00	100.0	
Selenium			NR
Silver	10.00	100.0	
Sodium	10.00	100.0	
Thallium			NR
Vanadium	10.00	100.0	
Zinc	10.00	100.0	

Comments:

Appendix F

Well Construction Data

Location of Registered Domestic Wells within a Three Mile Radius of PDHS
Source: ADWR Data Base

WELL LCCATION	OWNER	ADDRESS (Bisbee)	WELL DEPTH	CSG DIAMETER
(D-23-24)5cbb	RW White	Box 445	22	--
(D-23-24)5cbb	RW White	Box 445	30	6
(D-23-24)5cc1	DF Bateman	Box DG	40	24
(D-23-24)5cc2	DF Bateman Jr.	Box DG	45	30
(D-23-24)5cc3	RN McGinnis	Box 364	60	--
(D-23-24)5cdb	W Goren	110 E. Locklin Ave	211	12
(D-23-24)5dd	KE Tighe	Box 956	35	60
(D-23-24)6b	TH Eade	Parksburg, W.Va.	160	10
(D-23-24)6b2	TH Eade	Parksburg, W.Va.	50	10
(D-23-24)6cb1	CT Cleveland	Clinton, Ia	150	--
(D-23-24)7	TC Hargis	Box 1638	63	--
(D-23-24)7	EL Smith	Box 1306	45	--
(D-23-24)7	EL Smith	Box 1306	40	--
(D-23-24)7aa	JW Horstman	Box 1179	109	6
(D-23-24)7aa	JL Krause	Box 735	50	16
(D-23-24)7aa	JL Krause	Box 735	45	12
(D-23-24)7aaa	R Lopez	Box 758	40	48
(D-23-24)7abb	L Saner	Box 326	150	6
(D-23-24)7abb	DD Crowley	207 Bornite	150	6
(D-23-24)8	M Aiva	Box 316	28	--
(D-23-24)8ac(bda)	M Edwards	635 Tombstone Cnyn	25(50)	(24)
(D-23-24)8ba	CL Baugh	box 295	30	24
(D-23-24)8ba	WG Henwood	702 Tombstone Cnyn	60	--
(D-23-24)8ba	JE Siems	Box 12	--	--
(D-23-24)8ba	R Bamrick	Box 112	51	--
(D-23-24)8baa	LF Tschirhart	Box 1552	30	4
(D-23-24)8bad	AJ Kent	Box 141	50	--
(D-23-24)8bb	D Hogan	Box 823	79	16
(D-23-24)8bb	F Keough	Box 512	30	36
(D-23-24)8bb	RL Haynes	Box 1533	60	--
(D-23-24)8bbb	RD Wrye	942 W.Blvd	35	36
(D-23-24)8bbb	DW Danforth	1002 W.Blvd	--	48
(D-23-24)8bda	W Goren	Box 812	50	--
(D-23-24)8bda	RA Thursby	639a Tombstone Cnyn	50	24
(D-23-24)8bdb	FM Dugie	Safford, Az 85546	60	--
(D-23-24)8d	Roman Catholic Church	Drawer SP	42	6
(D-23-24)8dba	CS McCulloch	Box 1882	41	34
(D-23-24)8dba	CR Dilley	Tempe, Az 85282	--	--